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NOTES

ON

PRINCIPLES OF SURGERY,

BY

BLANTON L. HILLSMAN,

CLASS 1898,

UNIVERSITY COLLEGE OF MEDICINE,

FROM LECTURES BY

Stuart McGuire, M. D.,

PROFESSOR OF PRINCIPLES OF SURGERY, UNIVERSITY COLLEGE OF MEDICINE, RICHMOND, VA.; SURGEON TO ST. LUKE'S HOME AND VIRGINIA HOSPITAL.

RICHMOND, VIRGINIA:
JAMES E. GOODE PRINTING COMPANY.
1897.

PREFACE.

The following "Notes on Principles of Surgery" won the prize offered by Dr. Stuart McGuire for the best report of his lectures for the session '96–'97. They are published at the suggestion of several friends, and appear almost exactly as taken in the classroom.

I realize that they do not do full justice to my teacher, nor reflect great credit on myself, but trust that they may prove of service to my fellow students.

BLANTON L. HILLSMAN.

Richmond, Va.,
September 15, 1897.

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ON

PRINCIPLES OF SURGERY.

LECTURE I.

THE GERM THEORY OF DISEASE.

Ever since the fall of man from his perfect state he has been liable to disease, and being a selfish as well as an intelligent animal, he has devoted much study to its cause, in order that he might avert its effects. His earliest conceptions of disease, while amusing, were so clouded by ignorance and superstition that they scarcely deserve mention. The great Hippocrates, the father of medicine, for instance, maintaining that the body was composed of four humors—blood, phlegm, black bile and yellow bile—a right proportion and mixture of which constituting health, an improper proportion or irregualr distribution constituting disease; and it was not until the Phlogistic theory was advanced that we have evidence of anything like scientific reasoning. The PHLOGISTIC THEORY was based on a supposed analogy between combustion and disease. Physicians saw pestilence strike a community like a spark strikes among straw and kindling, attack person after person in society, as fire would leap from house to house in a city. Stahl had taught, and his views were generally accepted by chemists, that combustion was due to the liberation of a fluid or essence called *phlogiston*, which was inherent in all matter, and it was therefore inferred that if this be true there must be some substance in man himself which, once put in motion, acted similarly to fire and spread with deadly effect. This theory was long held, and

even to this day remedies which are directed against inflammation or inflammatory conditions are called *anti-phlogistics*.

The next hypothesis of importance was called the ZYMOTIC THEORY, and was based on the similarity between the processes of fermentation and disease. It was known that when yeast was added to certain solutions containing sugar certain changes occurred. It was observed that a very small quantity of yeast was necessary to inaugurate these changes; that the quantity of yeast was largely increased by the changes, and that the new yeast thus formed would again produce fermentation if added to fresh solutions. It was claimed that infectious disease presented similar characteristics; that disease was started by the introduction into the body of a substance similar to yeast; that the quantity of the substance was increased by the process, and that the substance was afterwards conveyed from the sick person to healthy individuals, thus reproducing the disease and rapidly diffusing it through a community. Confidence in the "*zymotic theory*" of disease was greatly strengthened when Jenner, in 1798, began the use of vaccine virus as a preventive of small pox. Here the physician had a substance which he could carry about as he could yeast. He could introduce it into the skin of a healthy person, and after a certain time a disease would manifest itself, just as he could introduce yeast into a solution of sugar, and after a certain time find changes of fermentation. A small amount of either was sufficient, and in each case a certain period of rest was observed before the characteristic changes were seen. Nor did the likeness stop here. It was found that intense heat destroyed the power of yeast, and the same was found to be true of vaccine virus. It was also known that when a solution of sugar had once undergone the process of fermentation, further change would not be produced by adding fresh yeast to it, and an analogy was found in vaccination, for a person once vaccinated is rendered insusceptible to further inoculation by the virus, at least for some years. All these facts furnished the strongest possible proof of the identity of the two processes, at least in mode of operation, however wide the difference in results, and the theory was generally accepted.

With the advance of knowledge during the present century the subjects of fermentation and putrefaction were earnestly studied.

Learned men in all parts of the world devoted their lives to their investigation; but it remained for the great scientist Pasteur to announce to the world, in 1858, their real nature. It had previously been supposed that they were due to the action of oxygen, and were a purely chemical process. Pasteur proved, by a series of experiments, whose ingenuity and originality have rarely been equalled, that they were due to the action of a living MICRO-ORGANISM, and hence were a vital process.

There lived at this period in Glasgow, Scotland, a surgeon named Joseph Lister, a man who, despite the demands of an active practice, found time for theoretical study. He read with interest the demonstrations of Pasteur and his fellow-workers, and at once concluded that the discovery was of great practical value. If fermentation and putrefaction could be prevented by exclusion of germs from a test tube, why could not disease, such as suppuration, be prevented by exclusion of germs from a wound? On this premise, as a basis, he began a series of experiments, and soon found that a wound made through clean skin, by a clean hand, with a clean knife, and protected by a clean dressing would heal without inflammation and without the formation of pus. The results were elaborated and published in 1865, and were the origin of "THE GERM THEORY OF DISEASE"—a theory which was destined to revolutionize the practice of medicine and surgery.

The application of the principles of the germ theory to the practice of medicine and surgery has been of untold benefit to mankind. In surgery, suffering is lessened, convalescence is shortened, and lives of patients are saved. Regions of the body are now safely invaded which were hitherto believed to be inaccessible, and operations are now successfully performed which, if suggested before, would have been considered the outcome of a diseased brain, or the freak of a disordered imagination. It is difficult for you who visit the hospitals of to-day and see the comfortable patients in their clean and airy wards, their wounds covered with artistic dressings and their faces free from evidences of pain or fever, to realize the dangers which beset a patient before the antiseptic era, or to have any conception of the horrors of a metropolitan hospital of the olden time. I recently read a description by a French writer of the Hotel Dieu, of Paris, a hospital whose wards were immedi-

ately over the dead house, and whose atmosphere reeked with the odors of putrefaction. A hospital whose only heat emanated from the bodies of its wretched inmates, and whose only ventilation was derived from the accidental defects of its structure. A hospital whose walls were soiled by expectorations from patients, and whose floors were covered with blood and pus from wounds. Into this pest house patients were packed four and six in a bed, and, in emergencies, were placed in tiers one over the other, so that some were reached only by the use of ladders. It is not surprising that gangrene and erysipelas were rife, and that one out of every four patients died. Lister is the magician who has wrought the change; the *germ theory* the agent he employed.

In medicine, too, the results accomplished have been marvelous. Plagues are prevented, epidemics are arrested, and contagious diseases are cured. One of the first great discoveries in this department was Pasteur's treatment of hydrophobia by inoculation. This great scientist, in order to study the disease, produced it artificially in a rabbit by injecting under its skin some virus taken from the mouth of a rabid dog. When the rabbit finally died, he took some of its blood and injected it into a fresh animal, and hydrophobia again developed. He noticed that the second case was more severe than the first, and further experiments proved that the disease became more intense each time it was reproduced. Pasteur concluded that if the germ became more virulent under certain circumstances, that there must be other conditions which would render it milder. Investigation at length resulted in the discovery of these conditions, and in the production of germs which were so attenuated that they could not produce the disease in an animal, but would protect it from an attack of the disease. A patient who has been bitten by a rabid animal can now be protected from the disease by being inoculated with weakened germs, and hydrophobia, formerly the most horrible and hopeless of all diseases, has been robbed of its terrors.

The civilized world was startled not many years ago by the announcement that Koch, of Berlin, had discovered a remedy for tuberculosis, the dread disease which causes the death of one out of every seven people who die. It was a well known fact that no animal could live in its own excreta; and by injecting the products

of the bacillus tuberculosis into the body of a patient suffering from consumption, it was believed the disease could be cured. The treatment was published prematurely, published before its value was determined by experiments, published without the consent of its originator. Koch's lymph or tuberculin has proven of little value, but it was an advance. Other investigators are now working on the same lines, and we may look forward to the result of the future with hope and with confidence.

Cancer, the terror of its victim, the "*bete noir*" of the surgeon, is by some believed to be due to a germ. It has been observed that its advance is frequently checked, and in some instances the disease is absolutely cured, by accidental attacks of erysipelas. Investigation has shown that there is an antagonism between the microbe, which is known to cause erysipelas, and on the principle of fighting fire with fire, erysipelas is used to fight cancer. The cancerous growth is inoculated with erysipelas, and sometimes the cancer is conquered. It is a desperate remedy, but it is used in desperate cases. Statistics certainly justify further investigation of the subject. The future only can determine its value.

The last advance which the *germ theory* has accomplished is in the treatment of diphtheria, a disease which hurries to an untimely grave so many of its victims. The treatment is an endeavor to increase the antiseptic power of the blood, and thus destroy the germ which produces the disease, and is carried out by injecting beneath the skin of a patient suffering with diphtheria a substance called Antitoxin. Antitoxin is prepared in the following way: The germ of diphtheria is placed in a test tube containing broth, and allowed to grow for ten or twelve days. At the end of that time it has saturated the broth with its specific poison, or *ptomaine*. The contents of the tube is then boiled, the heat killing the germ, but having no effect on the chemical poison it has produced. A young and healthy horse is taken, and a few drops of the solution injected beneath the skin. It makes him very sick; he has high fever, loses flesh and refuses to eat, but usually he recovers in two or three days, and at the end of a week is apparently well. He is then injected with the same material—this time twice the former dose being used—and again the same symptoms come on, though not so well marked. This weekly dose of poison is continued for

about six months, when the horse is found to have acquired a tolerance to its action, and can take an enormous dose without any bad effects being observed. To use a technical term, the horse has become immune. As soon as this is accomplished, the horse's neck is shaved and disenfected, one of the jugular veins opened, and about two gallons of blood withdrawn. The blood is allowed to cool, and the serum separated from the other constituents. The serum contains the antitoxin, and is concentrated and put in a suitable form for use. Before it is placed on the market, its power and strength is tested by observing its effects on Guinea pigs, in whom diphtheria has been artificially produced. The action of this new agent on diphtheria is remarkable. Used in the early stage, it always cures, and it is only when its employment is too long delayed that it fails. I have mentioned only a few of the many important results which the germ theory has accomplished. Only enough to show you its present practical value. Earnest men in all parts of the civilized world are working night and day upon the subject and no one can predict what the ultimate outcome will be. Perhaps the possibilities are not exaggerated by a French writer, who says: "When man learned to protect himself from wild beast, he made the first step in civilization. To-day man is learning how to defend himself from microbes; it is a step of equal importance. A day will come when in Berlin, in London, in Paris, a man will not die of diphtheria, of typhoid fever, of scarlet fever, of cholera, or of tuberculosis, any more than he dies in these cities to-day of the venom of snakes or the teeth of wolves." Candor compels me to admit that, despite the facts which I have adduced, and the logical conclusions which they bring, that the *germ theory* has not yet been universally accepted, and that there are still some men of prominence who do not yield in practice to its teaching. The medical skeptics are much more numerous than the surgical infidels, and this is explained by the fact that medicine is yet but an art, while surgery is a science. The physician treats maladies which are hidden from his sense of touch and sight, and whose symptoms give but vague indications of their real nature. He goes to the bedside of a patient, feels the pulse, examines the tongue, auscultates and percusses the chest, and prescribes medicines uncertain in their indication and indefinite in their action, and then either turns a prayerful eye

heavenward, or calls long and loudly on mother nature for assistance. It is natural that he should regard the germ theory with suspicion. The surgeon, on the other hand, meets the enemy face to face, and in his bloody battle with disease for the life or death of a patient, appreciates his power, and recognizes the potency of his remedies. By him the *germ theory* is accepted.

Only one surgeon of great prominence lives who denies its validity, and this is "Mr. Lawson Tait, of England," a man whose wonderful success in abdominal work has made his name famous throughout the civilized world, but whose love of notoriety renders the honesty of his views open to suspicion. In a recent paper read before the Birmingham and Midland Branch of the British Medical Association, entitled, "A Criticism of the Germ Theory of Disease Based on the Baconian Method," he represents the views of the agnostics as strongly and vigorously as it is possible for them to be put. At the onset of his remarks, he says he wants to remind those persons who now sneer at his views as those of a mere practioner, that for twelve years he was a hard working and enthusiastic microscopist, and that during that time he discovered much which was then unknown and unraveled the minute anatomy of certain structures with a completeness that has defied further addition. He says that the germ theory is simply an amusing hypothesis, by which everything is explained and under which everything is squeezed. He says that the fact that the origin of certain diseases is due to a poison has always been recognized, but the suggestion of the immediate machinery has curiously varied. The ancient Greeks and Hebrews believed that disease was a blow from an offended deity, and the Christian's favorite doctrine was that it was a visitation from the devil; for both the modern scientist has substituted the microbe, which is no logical advance over the belief of either. The ancient Jews were very practical and business like people, and could have written sanitary articles in medical journals much better than some of their descendants do now. They knew the facts of sepsis, and had the most elaborate schemes of antisepsis, whose stringency of detail were not much more ridiculous, or probably much less satisfactory, than many of those which have emanated from Lister himself. Mr. Tait then takes up the application of the germ theory to the practice of surgery, and says

that, being a very clumsy barber, he has no doubt he has implanted myriads of germs in fresh wounds inflicted on his face while shaving, and that no septic results have followed in his own case or in thousands of fellow sufferers. He ridicules the technique of antiseptic surgery, and uses as an illustration of its absurdity an article recently written by an American, in which, with great enthusiasm, the writer describes the method by which he performs an exceedingly simple operation on a child, giving in detail the antiseptic precautions. He observes: "Sterilized gauze, sterilized bandages, and a properly sterilized cradle and nurse," says Mr. Tait, "secures the recovery of the germ-endangered baby, and no doubt a formal operation fee is charged after the danger is all over." Mr. Tait says that he has done a good deal of operative work, and he has never used anything but absolute cleanliness, and yet his published statistics have never been equalled. He says he has challenged Sir Joseph Lister over and over again to compare results with him, but he has ignored him with lordly indifference. He says that the details of Listerism change with marvellous rapidity, and before they are six months old, are pronounced failures and are replaced by something new. The last of all these numerous phases is the disuse of chemical destroyers of germs and the adoption of aseptic surgery, which is nothing but perfect cleanliness, a principle which he has been preaching for years, and now, forsooth, it is the newest Listerism. Mr. Tait says that after his early experience in surgery, it is a wonder he ever stuck to it; that during his pupilage in Edinburgh, he saw thirty abdominal tumors removed without a single recovery, and that when he left the land of his birth it was with one fully made resolution—that he would never open an abdomen. In Edinburgh, if he saw the amputation of a thigh in the old Infirmary on Wednesday, there was a strong probability that the following week he would see the bared bone sticking through the anterior flap. If a breast was removed, an erysipelatory reddening of the flap would very probably occur on the following day, and would be half way round the chest before the week was out, and the wound gaping and everything going to the bad. He left Edinburgh, and has been engaged continuously for the past twenty-eight years in making wounds, and he has never seen a case of erysipelas in his own practice. The improvement lies in the separa-

tion of patients, plenty of cubic space and fresh air and is in nowise the result of chemical germicides. Mr. Tait says that it was Simpson who cried out most loudly for better ventilation and cleanliness, and against the use of dirty hands and sponges, and he has been dead hardly these five and twenty years, and all his splendid work is as much forgotten as if it had never been done, and the glorious progress which has come out of it is given to a theory, which is no theory at all, but a phantasm, a system which has been proven an inconstancy and a broken reed—a thing which yields at every blast, either to scholastic logic or eclectic experience. It will be seen that Mr. Tait recognizes the existence of a poison which produces disease, but refuses to admit that it is of microbic nature. He insists upon the importance of cleanliness, and upon the avoidance of contaminating wounds with dirt, but fails to say of what dirt consists. He prefers to deal in generalities—to speak of contagion as a condition, not an entity. If it gratifies him to call by the name of *dirt* what his more advanced contemporaries have resolved into *micro-organisms*, it is a weakness of his brain, which should be pardoned on account of the cleverness of his hands. If, in practicing cleanliness, Mr. Tait has practiced aseptic surgery, so much the better for Mr. Tait; but he did it instinctively, purposely, and to have expected others to follow an example, for which he could give no reason, would be as illogical as to expect fruit from a tree which had no roots or water in a brook which had no source.

The followers of Lister have, in the past, been guilty of many absurdities, and in their ranks are still found theorists who ride their hobbies hard. Many apparently contradictory facts still remain unexplained, and the results of experiments, which seem diametrically opposed, have still not been reconciled, but all this will be remedied in time. When germs can be examined microscopically, can be differentiated by appearance, can be cultivated in the laboratory, and can have their effect, when introduced into a healthy organism, accurately foretold, the science of bacteriology is not a farce. When a germ fulfills the requirements of Koch's; when it is always found accompanying a disease; when it can be cultivated from the tissues of the animal dead of the disease, and when it will reproduce the disease if inoculated into a second ani-

mal, it certainly seems, to an unprejudiced mind, that it is the cause of the disease.

It is, of course, impossible to demonstrate positively the truth of the "*Germ Theory*," but such is the case in many other branches of science, and is no reflection upon medicine. No one would question for a moment the assumption of the truth of the "*atomic theory*," and yet without that basis upon which to build, the proud structure which has been erected by the chemist would fall into chaos. It is impossible for the Christian to demonstrate the existence of a "*Deity*," and yet, without the faith inspired by their belief, civilization would totter and barbarism return.

LECTURE II.

SURGICAL BACTERIOLOGY.

Bacteria, Micro-organisms, Microbes or Germs, are synonymous terms for minute vegetable plants belonging to the lowest order of the vegetable kingdom and are closely allied to the algae. As the minute cells possess the power of motion, they were for a long time thought to be of the animal kingdom, but this theory has been abandoned. There are two kinds of bacteria —*Non-pathogenic*, or those which do not cause disease, and *Pathogenic*, or those which cause disease.

Non-pathogenic germs produce fermentation and putrefaction. They are seen producing fermentation in the manufacture of beer as yeast and in removing dead bodies by putrefaction.

Pathogenic germs produce disease and are of many kinds, exceeding minute in size, being from 1 to 4 MM. in diameter. One writer speaks of them as the "*infinite little*," another says they require to be magnified seven hundred times to be seen, and still another claims that one thousand of them can pass through the eye of a needle abreast. They are composed of protoplasm, are unicellular, the nucleus and nucleolus has not been found, but prob-

ably exist. The protoplasm consist of an albuminous substance called *Mycoprotein*, and is incased in a membrane of cellulose containing a little fat. So we may define a bacteria by saying: 1. It is a plant; 2. It is a cell; 3. It is formed of protoplasm; 4. It is incased in a membrane.

Most all bacteria are colorless and transparent, but occasionally some are found that are colored, such as blue, red, etc. A great many are capable of motion which is accomplished by the movement of their processes called *Cilia;* others are not capable of motion and are carried by the fluids of the body. In looking at a microscopic preparation you will see single bacteria and also will find them in masses, these masses are formed by their investing membrane becoming glutinous and they adhere one to another and are called *Zooglea.*

Theory of a Common Botanical Origin of Microbes.—All bacteria at one time were supposed to have a common origin; it was thought the children of any parent might be a *cocci* or *spurilli*, and any one of them might produce Tetanus or Erysipelas or any of the specific diseases. This theory has been discarded, and it is now known that the round germ begets a round germ, the germ of suppuration begets a germ of suppuration, the germ of erysipelas begets a germ of erysipelas, there being no possibility of crossing them, as they invariably breed true.

Three Principal Forms of Bacteria.—We recognize three forms of bacteria: 1. The round or *coccus;* 2. The rod or *Bacillus;* 3. The curved or *Spirillum.* The *cocci* are comparatively easy to kill, and fortunately for the surgeon they are the cause of most of the diseases.

Combination of Cocci.—If a coccus meets another and they join it is called a *Diplococci*; when four of them join it is called a *Micrococci tetragones;* when they form a chain it is called a *Streptococci;* when they form like a bunch of grapes it is called a *Staphylococci.*

Multiplication of Bacteria.—Bacteria are capable of multiplication or reproduction which takes place by two processes—*Fission* and *Spore formation.*

Reproduction by fission, when observed under the microscope, the baceria at first is seen to get longer and a little oval in shape,

a depression is next seen in the bacteria, which causes it to assume a dumbbell shape, the depression increases and finally the bacteria splits into two equal halves, the halves grow and soon become as large as the mother cell and is then capable of propagation and reproduction.

Reproduction by spore formation: Take a bacillus under the microscope, it looks homogeneous and transparent at first, then near the centre you will see a slight thickening which gradually increases in size, becomes more round and approaches the margin of the cell, it finally reaches the margin of the investing membrane, produces pressure on it, causing it to disintegrate and the spore burst through and is set free; its subsequent feats depends on the soil it gets into. The *cocci* always divides by fission, the *bacilli* by spore formation and the *spirilli* may divide either by spore formation or fission.

Characteristics of Spores.—Spores differ from bacteria in their resisting power to external influences. It is invested by a thick, tough shell, which makes it harder to kill and to render immune. So when dealing with a cocci you can make your material more sterile, because they are easy to kill, but when dealing with a bacilli, which is always accompanied by spores, it is harder to kill, and therefore you will have to use stronger germicides than when dealing with a cocci, but, as before said, we are fortunate that the cocci cause most of the diseases.

Essential Conditions for the Growth of Germs.—Bacteria are plants and require certain conditions for their growth and reproduction. The most important conditions are Temperature, Food and Moisture. The temperature varies for different germs, some require low and some high temperatures, but most of them grow better between 86 degrees and 104 degress F. Some grow below 86 degrees F., others above 104 degrees F. Most of them find the temperature of the body most delightful. The food must be of organic matter, the best is decomposing organic matter. They require moisture as well as any other plant. A certain degree of heat is necessary for the life of a germ, but if it is carried too high it is death to them; some are killed at 140 degrees F., others at 180 degrees F., their hardihood varies with the species, but all perish when kept at 212 degrees F. for any length of time. Moist

heat is much more efficacious than dry heat. Moist heat will kill any germ at 212 degrees F. in five minutes. It is the popular opinion that cold kills bacteria; this is not so, it makes them incapable of infection for awhile, but after being thawed out they infect with as much virulency as ever. Cohn subjected germs to a temperature of 180 degrees below zero, and then gradually brought them back to their original temperature, and when injected into an animal they produced their specific disease. Acids are death to germs, whereas they thrive in an alkaline media. The germicidal drugs are Bichloride Mercury, 1-10,000 will kill them and 1-1,000 will render anything sterile. This drug should be used with caution, as it is a powerful poison. Carbolic Acid ranks second, a solution of 1-100 will exterminate germs and a 3 per cent. solution will sterilize instruments. While carbolic acid in water is a powerful germicide, in oils it is inert. Boracic and Salicylic acids are used in a 2 per cent. solution for irrigating wounds. Iodoform is a powder applied to wounds to prevent fermentation and putrefaction. It is not an antiseptic in the dry state, as germs will grow in it, but when it comes in contact with the secretions it gives off free iodine, which is an antiseptic.

Distribution of Bacteria in Nature.—Bacteria are found everywhere, on the skin, clothes, in the air, water, mouth, etc., and it is only by the provisions of nature that we are protected.

Divisions of Pathogenic Bacteria:

1. Saprophyte—Lives in dead matter only.
2. Parasite—Lives in living matter only.
3. Ectogenous—Lives only outside of the body.
4. Endogenous—Lives only inside of the body.
5. Aerobic—Requires oxygen for life.
6. Anaerobic—Does not require oxygen for life.
7. Chromogenous—Imparts color to fluids in which it grows.
8. Non-chromogenous—Does not impart color to fluids.
9. Pyogenic—Produces pus.
10. Non-pyogenic—Does not produce pus.
11. Gasogenic—Growth results in the formation of gas.
12. Non-gasogenic—Does not produce gas on growth.

LECTURE III.

SURGICAL BACTERIOLOGY—Continued.

Toxins and Ptomaines.—When a pathogenic germ is put in a test tube or introduced into the tissues of the body under suitable conditions, it generates a poison which is known as "*Toxins* or *Ptomaines.*" It is not definitely known how this material is elaborated, and many different theories exist to explain its production. The simplest and most plausible is that germs, like all other organisms, have excretions, and that the excrementitious matter which they throw off constitutes the poison. Toxins and Ptomaines are chemical substances, and are not affected, as are bacteria, by either heat or germicides. They closely resemble the vegetable alkaloids—strychnine, morphine and atropine; and when introduced into the system cause serious disturbances. There is a characteristic difference between bacteria and its ptomaines or toxins; bacteria is a living cell, capable of reproduction; toxins or ptomaines do not possess this function of reproduction and produces their effects just as any other alkaloid, and the symptoms are in proportion to the amount and variety injected. The ptomaine or toxin of different germs has distinct characteristics. Thus the ptomaine of the germ of suppuration produces pus, the ptomaine of the germ of lockjaw produces convulsions, and the ptomaine of the germ of diphtheria produces paralysis.

Entrance of Bacteria Into the Body.—Bacteria comes from without, and are conveyed to the body by actual contact. The air rarely convey germs to a wound, but they are implanted by dirty hands and instruments coming in contact with the wound. Lister would not operate, not many years ago, unless the air of the room was made sterile, he had an assistant on either side of the operating table with sprays of antiseptic solutions playing around the wound to sterilize the atmosphere; this source of infection has been proven to be of minor importance, and instead we make our hands sterile, our instruments sterile, and, in fact, everything that

is in danger of coming in contact with the wound. So we make these conclusions: That there are but few bacteria in the atmosphere; that bacteria are not conveyed to wounds by the air, but by actual contact of dirty hands and instruments.

Bacteria cannot pass through the unbroken skin or mucous membrane, they act as an effectual barrier, and only when there is some lesion or "*Infection Atrium*" can they enter. After the germs have entered the body through the broken skin or mucous membrane other conditions are necessary before they can cause disease, they may circulate freely in the blood, but will cause no diseased conditions. So we say and prove that it is to their localization, which takes place if they find an impaired or weakened tissue or "*Locus Minoris Resistentiæ.*" Experiments prove the above: A solution of the germs of putrefaction was made and injected directly into the blood of a healthy lamb, but no disease resulted; another lamb was taken, his testicles crushed and the germs injected and Gangrene resulted; in the last experiment the germs found a weak, injured testicle in which they could localize.

Action of Pathogenic Bacteria on the Tissues of the Body.—It is not fully settled how bacteria acts on the living tissues; some produce locally irritation or Inflamation; and the chemical substances produced in this process is absorbed and diffused throughout the body, and in virtue of its ferment-like action greatly increases the tissue metamorphosis and acting on the thermic centres produces fever and other constitutional disturbances known as *Septic Intoxication* or *Toxic Infection.*

Elimination of Pathogenic Bacteria.—After the germs have entered the body and finds no suitable soil to live in, how does nature dispose of them? It is accomplished by *Phagocytosis* and *Excretion.* The blood is not only itself a powerful antiseptic, but it contains a cell called Phagocyte or white blood corpuscle, whose duty it is to protect its home and to attack all invaders. The phagocyte is capable of swallowing a bacteria, digesting and excreting them incapable of producing disease. When the phagocyte and the germ meets a battle royal ensues, and the phagocyte is usually the victor, unless the germs are in such numbers to successfully overpower them, when the reserve guard, the emunctory organs, are ordered to the front. It can be proven that these

organs, such as the kidneys, skin and bowels, eliminate disease germs, as you can inoculate an animal with the urine or feces of a patient suffering from Scarlet or Typhoid fever and produce the disease. The old physicians called these discharges "*Critical discharges*," but did not understand it; but it is now proven by the germ theory, as in a case of typhoid fever, when the patient's life is almost despaired of, the kidneys will sometimes commence to act freely, and the patient recovers. So now we know that the "*Critical discharges*" of the old physician is nature trying to eliminate the germs which has overpowered her advance guards, the *Phagocyte.*

The Study of Bacteria.—Bacteria are studied Microscopically by cultivation and by inoculation. It has only been by recent inventions that we are able to study bacteria microscopically. At first, owing to the minuteness of the organism and the imperfection of the instruments, small progress was made; but with the advent of Abbe's condenser, which gives powerful illumination to the section and allowing the use of high power lens their study is very easy. Then, by a process of staining, we can readily distinguish them. By the use of aniline dyes we stain the section, and then by washing with alcohol we can remove the stain from the tissue, but on account of the strong affinity for dyes, which the bacteria possess, they are unaffected, or we can further use contrast stains, and so give the germs a blue color, the cells a yellow color and the tissues black; and in this way we can study their shape, motion, mode of reproduction and in this way learn to distinguish one from another.

The cultivation of bacteria is carried on in test tubes. In cultivating them, remember they are plants and for their growth require a suitable soil, warmth and moisture, under these conditions they grow rapidly. The best soil or media is animal broth, solution of sugar, gelatin, blood serum and agar agar, the latter a jelly-like substance obtained from seaweeds. The media is first heated to kill any germs that may be in it, then, with a clean needle, secure your germ, touch the media, close the tube, put it in an incubator, and in a short while you will have millions of germs. According to Cohn, during one day, a single coccus will produce 16,000,000, at the end of the second day 281,000,000,000. Some give to the

media a red color, others blue, etc., and a skilled observer can recognize the specie by the manner in which they grow and the color given to the media. Much information concerning bacteria has been obtained by inoculating or injecting them under the skin of animals and noting their effect. An animal is taken (rat, guinea pig or rabbit) and the hair is shaved off, the skin disinfected, so as to be sure you do not implant any other germ, and a solution of the germs is then injected under the skin with a hypodermic syringe, or an incision is made in the animal and a piece of the infected tissue is implanted; in three or four days the symptoms of the specific disease the germs experimented with produces will be apparent, and in case of virulent diseases the animal dies. This process is of great aid to the surgeon in making a diagnosis; his patient may show a tumor, and a positive diagnosis, whether due to syphilis or tuberculosis, can't be made; inoculation gives him a certain diagnosis, he takes one of the lower animals, puts a small piece of the tumor in its cellular tissue, if the tumor is syphilitic, the animal will show no symptoms, as man alone possesses the distinction of this disease; but if it be of tubercular origin, the characteristic symptoms are soon displayed.

Isolation of Various Bacteria.—Certain diseases are produced by a certain germ: the germ of tuberculosis always produces tuberculosis, the germ of pneumonia always produces pneumonia, the germ of typhoid fever always produces typhoid fever, etc., and Koch, by his experiments, has set forth these four laws as invariably true; and before a germ can be said to produce a disease they must be fulfilled.

1. The germ must invariably be found accompanying the disease.

2. When the animal dies you must be able to breed the germs in a test tube, and by successive cultivations entirely remove all the tissue of the animal from which they were obtained.

3. You must be able to reproduce the disease in another animal with the cultivated germs.

4. When this animal dies you must be able to find the same germs in its tissue that were originally used.

Attenuation and Antagonism of Bacteria.—The germs of different diseases have been subjected to all sorts of tests, tried under all sorts of conditions, in order to learn their peculiarities. Many

strange facts have been learned. One is that bacteria of great virulence can be rendered weak and comparatively harmless by breeding them under adverse conditions, just as the Bushman of Africa has been deteriorated by existing for years under debilitating climatic conditions. Another curious fact is, that certain species of germs have violent antipathy for each other, and, if placed in the same media, will devote all their energies to a conflict, and it is only after one species has exterminated the other that multiplication begins. The practical usefulness of these observations is obvious, for already are we attempting to cure cancer with the germ of erysipelas owing to their antagonism.

Theory of Immunity and Predisposition to Disease.—It has been observed that some people "*catch diseases*" easily, that others never take them at all, that some people have a predisposition to disease, and others an immunity to it. This is explained by the fact that a person who has a tendency to acquire every disease to which he is exposed has blood and tissues which have feeble resisting power, which presents a favorable soil to the growth and development of germs. A person who does not acquire disease to which he is exposed has blood and tissues which have strong resisting power, which presents an unfavorable soil to the growth and development of germs.

Theories of Protection.—One attack of many microbic diseases, such as smallpox or scarlet fever, prevents a subsequent development of the same disease. This is explained by the fact that each germ requires a special food to support its life and vitality; that when it once infects an organism it consumes all of the special food the blood contains; that this special food is never replaced, and that owing to its absence the germ cannot again maintain an existence in the organism.

LECTURE IV.

INFLAMMATION.

Introductory Physiology.

The Blood.—The blood is the most important constituent of the body. It is the means by which all the tissues are directly or indirectly nourished, and is also the means by which the material resulting from the metabolism of the tissue, as are of no further use in the economy, are carried to the ecretory organs to be removed from the body. It also serves to moisten and warm the body. It is composed of Blood plasma and Blood corpuscle. The blood plasma is the fluid portion of the blood, it is a clear, yellow, alkaline fluid, specific gravity 1,020. The blood corpuscles represent the solid element of the blood, and are of three kinds—White, Red and the third blood corpuscle, or blood plates. The White blood corpuscles, are to pathologist the most important. They are round or spherical nucleated mass of protoplasm, having no investing membrane or cell wall, and is about 1-2500th of an inch in diameter. Its shape is retained by a delicate skeleton, made up of a reticulum of protoplasm. They possess two very important functions, both of which depend on its power of changing its shape, viz.: Amoeboid movement and phagocytosis. These endowments are accomplished by the hyaline strings of the reticulated skeleton, which not only gives shape to the cell, but is endowed with muscle-like contraction. In contracting, an arm is thrown out and retracted, another is thrown out and retracted, or the whole cell may flow into it, thus changing its position and accomplishing what is called Amoeboid movement. Phagocytosis is accomplished much in the same way, it throws out an arm on each side of a germ or diatom, the arms meet and so encloses it, it then either digests and assimulates it or it remains in the cell as a foreign body.

The red corpuscles are much more numerous than the white, in a normal state of health, the proportion being about 1 white to 500 red corpuscles. The red corpuscle is a round, biconcave disk, with-

out a nucleus, when viewed singly it is yellow, but are red "*en masse.*" It is composed of a colorless, structureless and transparent filmy framework or stroma, which is infiltrated in all parts with haemoglobin. It does not possess the function of amoeboid movement or phagocytosis.

The third blood corpuscle or blood plates, have only been demonstrated in the last fifteen years. They are much more numerous than the red corpuscles, are round, slightly colored, and much smaller than the red corpuscle and contains no nucleus. It was first thought to be a red corpuscle in infancy, but this theory has been abandoned, as we now know that the red corpuscle is thrown into the vessels fully developed from the red marrow of bones. The function of the third corpuscle is the production of a clot, as they carry all the ingredients necessary, so, in reality, they act as a guard against hemorrhage.

The Circulation.—The circulation may be described as the passage of blood, forced or pumped by the heart through the vessels to every part of the body. The heart is provided with valves to prevent regurgitation, and by its powerful contraction the blood is sent first through arteries, capillaries, and then through the veins back again to the right side of the heart. Now, as inflammation is so intimately connected with the circulation, we must study the structure of the tubes through which the blood flows. The arteries are formed of three coats, superimposed one on the other; we have, first, the inner coat or Tunica Intima; second, middle coat or Tunica Media; and, third, outer coat or Tunica Adventitia. The tunica intima is made up of layers of elastic tissue lined by endothelia cells; the tunica media is made up of muscular tissue, and the tunica adventitia is made up of dense connective tissue and is the strongest and toughest of all the coats. The arteries, then, are seen to be dense, thick, impermeable tubes, not even are their own walls supplied by the blood they carry, but by small arterioles called "*vasa vasorum.*" As the arteries approach the capillaries, their walls become thinner and thinner, until, when they are reached, they are composed only of one layer of large endothelia cells, which are so thin that the blood plasma goes in and out the vessels and so supplies the tissues with nutriment. The study of the capillary walls is facilitated by staining them with nitrate of

silver, when the cell will be seen to be placed edge to edge and held together by an amorphous cement substance, and at regular intervals very small openings are seen between the cells, called by Arnold "*stigmata.*" The capillaries run into veins, whose coats again commence to thicken and become impermeable, until in the large veins the three coats of the arteries are assumed. If a section of tissue be put under the microscope and the current of blood watched in the vessels, two currents will be seen, one in the middle called the Axial current, the other near the wall of the vessel called the Peripheral current. Both currents run the same direction, but the axial current, in which flows the red corpuscles, is about ten times as fast as the peripheral current, in which the white corpuscles and blood plates flow. These two currents exist in any fluid pumped through an elastic tube, therefore they must exist in the arteries, capillaries and veins.

Inflammation.—To define the term is difficult, but probably the best is given by Sanderson, as follow: "*Inflammation consists of a series of a histological changes which occur in living tissue when it is injured, provided the injury is not sufficient to immediately destroy its vitality.*

Causes.—There has been held, as the cause of inflammation, for many years, three theories, the last of which is the most modern. 1. Traumatic; 2. Chemical; 3. Microbic. A blow, stab, cut or sprain is a specie of traumatism; burns of a match, nitric acid, etc., is chemical. But the modern surgeons exclude the above as causes of inflammation and name them only as exciting or predisposing causes, creating a place in which the germ may locate and cause the trouble. Ninety-nine per cent. of suppuration inflammation is caused by a microbe (Senn only gives the microbe as the cause).

Pathology.—To study the process of inflammation the following artificial method has been instituted. A frog is taken and three or four minims of curara is injected subcutaneously, this does not interfere with the circulation, but causes paralysis immediately.

Make a small slit in his belly, draw out the intestines and irrigate them with nitrate of silver, place under the microscope and the changes can be readily followed. When you first look everything will be normal. 1. As soon as inflammation commences the blood vessels dilate, and the flow of blood is accelerated, due to

stimulation of the vaso-dilator nerves, this is the stage of Hyperaemia. 2. The vessels continue to dilate until their walls are paralyzed from overdistention, the current becomes slower, caused by more blood coming to the part than can be carried off by the veins, this is the stage of Congestion. 3. In a short while the current ceases, due to the plugging up of the veins by the white corpuscles accumulating in large numbers, and there is stagnation called the stage of Stasis. With the stage of hyperaemia the red corpuscles remain in the axial current and the white corpuscles in the peripheral current, but with the stage of congestion it is observed that the red corpuscles also go to the periphery. The white corpuscles next become glutinous and adhere to the wall, and another will come along and knock it off, as if trying to keep up the flow, but they finally adhere to the wall in such numbers as to cause complete stoppage, and we have the stage of stasis.

In inflammation there is always swelling, due to accumulation of the blood in the tissues, which escapes at the same time the foregoing phenomena are taking place. The constituents of the blood go through the vessels wall by two processes—Transudation and Exudation. Transudation is the escape of the fluid element of the blood by percolation. Exudation is the escape of the corpuscular element, and is a much more complicated process: as inflammation progresses the stigmato grows larger, a white corpuscle will stop at one of them and will finally work its way through by emigration, stretching the hole larger and then the red corpuscles escape by diapedesis. Although the white corpuscle is larger than the red, it goes throught first, and it does so by virtue of its ameboid movement. Sometimes a rent is made in the wall of the vessel large enough for a quantity of blood to escape, which constitutes a hemorrhage and is called *Rhexis*.

LECTURE V.

INFLAMMATION.—Continued.

Symptoms.—*General.*—These are due to the absorption of the toxins into the system, which toxins are the product of the germ which caused the inflammation. There is a chill, followed by fever, headache, weakness and nausea.

Local.—The classification of the local symptoms, enumerated by Celsus 500 years ago, is still recognized as the best. He gave five cardinal symptoms:

1. Dolar—pain.
2. Calor—heat.
3. Rubor—redness.
4. Tumor—swelling.
5. Functio laesa—impaired function.

Inflammation is invariably accompanied by pain, which is caused by pressure on the nerves or by direct inflammation of the nerve filaments. The intensity of the pain varies under certain conditions; it will be more intense, everything else being equal, in parts richly supplied by nerves, than in a part with poor innervation; it is less in parts that are elastic and loose, because when the exudations are poured out the tissue can give away and thus lessen the pressure it would produce. The character of the pain differs in different individuals, and in the same individual according to the location of the inflammation, as in inflammation of the skin, the patient will say the pain is burning; in peritonitis, it is darting; in the bone, it is gnawing, and in loose connective tissue, it is throbbing. It differs according to the anatomical tissue involved, the location of the pain is generally at the seat of inflammation, but in rare instances it is referred from the seat of inflammation by the nerves elsewhere, as in Pott's disease of the spine the pain is located in the stomach, instead of in the back; in hip joint disease the inflammation is in the acetabular cavity, but the pain is referred to the knee and it is often treated for rheumatism of the knee joint. These symptoms are spontaneous, but there is also tenderness on

pressure about the part inflamed, which is a great help in making a diagnosis, as the surgeon cannot only make out the seat of inflammation, but can tell the extent to which it has progressed. The difference between a neurotic pain and an inflammatory pain is that the neurotic pain is relieved on pressure, and the pain of inflammation is intensified.

Redness is a most natural sequence and is caused by the increased amount of blood to the part. The color varies with the different stages: in the stage of hyperaemia the part is of a bright scarlet hue of arterial blood, and in the stages of congestion and stasis the blood is dammed back, and the part assumes the blue color of venous blood. Swelling invariably accompanies inflammation. It is caused by the ditalation of the blood vessels, the escape of the fluid element of the blood by transudation, and is further increased by the exudation of the corpuscular elements of the blood.

The heat of the body is generated largely in the muscles and glands, and is conveyed to all parts of the body by the blood. This symptom of heat in inflammation is well represented by the boiler in a house. From the boiler in the basement the steam is generated and is carried to the different rooms by pipes, the quantity of heat in the rooms depends upon the amount of steam passing through the pipes, so with the tissues in inflammation, the amount of blood to the part is increased and, consequently, the heat is also increased, but never above the maximum temperature of the blood. This symptom is of diagnostic value; by it we can tell whether the swollen part covers a malignant tumor or is the seat of some inflammatory trouble, a surface thermometer being applied to the part.

Deranged function may be in a direction of increased or diminished physiological activity, as in inflammation of a joint—as the knee renders that joint useless, whereas in the inflammation of a mucous surface, as in a bad cold, the function of secretion is increased and there is a large amount of mucous poured out.

Termination.—Inflammation may terminate by Resolution, Suppuration or Necrosis.

Under favorable conditions and the proper treatment, the inflammation will subside and the parts will return to their normal condition; this is a most happy termination and is called termination

by resolution, which takes by the removal of the cause of the inflammation; the phagocytes exterminates the germs and nature completes the cure by removing the exudations and transudations by the lymphatics. But suppose, in spite of everything you can do, the inflammation goes from bad to worse, the site of the process enlarges and at one point assumes a purple color, gets soft, you then hope that suppuration will occur, you wait, it may or may not occur, but instead necrosis takes place, and you have sloughing, due to the blood being entirely cut off by pressure and the tissues die from want of food. In a boil you find what is called a "*Core*," this is nothing but a mass of tissue which has undergone necrosis.

Diagnosis.—This is usually simple. The diagnosis is not based or can't be depended on from the general symptoms, but is based on the local symptoms, especially heat. Heat is the most important symptom, and without heat, although there may be all the other cardinal symptoms, you do not have inflammation.

Prognosis.—The prognosis is based on 1. The character of the cause; if it be caused by the Gonococci, the prognosis is favorable, and its termination looked for in two or three weeks, but if it is caused by the bacilli of Tetanus, the prognosis is grave and the death of your patient expected. 2. The anatomical tissues involved, if it is the brain, of course, it will be more grave than the tissues on the back of the neck; if it be the vocal cords, it will be more serious than an inflamed ingrowing toe nail. 3. General condition of the patient: Inflammation occurring in a very feeble old man or in a drunkard or in a person with lowered vitality from any cause, gives a more grave prognosis than when occurring in a young, robust, temperate individual. 4. Accessibility of the disease to surgical treatment: If the inflammation be of the mastoid cells, which can only be reached by a very dangerous operation, the prognosis will be graver than a boil on the back of the neck, which is readily accessible to surgical treatment.

LECTURE VI.

INFLAMMATION.—Continued.

Classification.—The various types of inflammation are not due to any difference in their pathological changes, but to difference in the intensity of these respective phenomena, so it is not a difference in kind, but in degree.

The types of inflammation are modified. 1. *By cause:* As inflammation produced by the germ of suppuration; inflammation produced by the germ of erysipelas, etc. 2. *By degree:* Acute, sub-acute and chronic inflammation. This does not mean that there are three different kinds of inflammation, for, in fact, they are so much alike that it is only in their onset that we can diagnose one from the other. We speak of acute inflammation when the symptoms of development are rapid, this is a very dangerous form. When the symptoms of development are slower and the inflammation lasts two or three weeks. we call it sub-acute inflammation. When the symptoms develop not very fast or very slow and the inflammation does not respond to treatment, we call it chronic inflammation. 3. *By product:* In inflammation there is always transudation and exudation of the elements of the blood into the surrounding tissue. If the transudation of the fluid element is greater than the exudation of the solid element, we call it Inflammatory transudate. If the exudation is in excess of the transudation, we call it Inflammatory exudate; this is rarely seen. The difference in the amount of transudate and exudate, which is noticed above, is due to some peculiar microbic change in the tissues. In all inflammations there is always a certain amount of red corpuscles in the exudation, but not in such quantities as the white, but occasionally the red corpuscles escape in greater amounts than the white corpuscles, and the tissues become stained a bright red, and as the inflammation subsides the haemoglobin dries in the tissues and leaves them permanently colored; no expianation can be offered for this increased escape of red corpuscles, it is a very serious condition and is called Hemorrhagic inflammation. In some instances

the elements of the blood which are thrown out into the tissues become pus, the transudate forming fluid pus, the exudate forming pus corpuscles; this is called Suppurative inflammation and will be treated of in a subsequent lecture. 4. *By variety of tissue primarily effected.* (a) *Non-vascular tissue.* We know there are certain tissues in the body which are non-vascular, and derive their nutrition by percolation of lymph from surrounding arterioles. The cornea and cartilage is an example of such non-vascular tissue. Now remembering the pathology of inflammation, we note that the first changes affected the blood vessels; now as in the cornea, where we have no blood vessels, how does inflammation occur? It occurs in this way: If you irrigate the cornea with nitrate of silver, which results in inflammation, we will notice that the blood vessels encircling the cornea becomes dilated, and the lymph and white corpuscles escape, with the result that the lymph spaces are found packed with them; soon new blood vessels will form from these vessels and extend to the cornea, and the inflammation proceeds as before described. If resolution takes place, the newly formed blood vessels shrink and finally disappear, leaving the sight uninjured, but if suppuration occurs the vessels are not obliterated and the sight remains permanently injured. In cartilage, which is still more poorly supplied with blood, the process is almost identical. When irrigated with Silver nitrate, the vessels in the perichondrium becomes dilated and throws out lymph and white corpuscles, and the new vessels then form from the vessels in the perichondrium and extends to the cartilage and inflammation then proceeds as before described. (b) *Vascular tissue.* The spleen and liver is an example. These glands are made up of cells which elaborate their secretions and are called Parenchymatous tissue; they are divided off into lobes and lobules by fibrous tissue, which is called Interstitial tissue. When inflammation first attacks the specific secreting cells of a gland it is called Parenchymatous inflammation, and the cells soon disintegrate, causing death. When inflammation attacks the fibrous septa first, it is called Interstitial inflammation, and the organ soon becomes hard and firm. It is difficult to tell which portion of an organ is first attacked, for in parenchymotous inflammation the interstitial is soon also set up and *vice versa.* When inflammation attacks serous surfaces as the peri-

toneum, pleura or synovial membrane, it is called Serous inflammation; this may follow several different types, as Effusive Serous inflammation, this is caused by the effusion of the fluid element of the blood, accompanied by very little of the solid element. This is well seen in serous inflammation of the knee joint, when a large amount of serum surrounds the joint: Adhesive Serous inflammation, this is when the solid elements escape in greater amounts than the fluid element, the surface of the membrane becomes coated with the corpuscles, causing them to adhere; Suppurative serous inflammation is merely a later stage of either of the preceding varieties, caused by the pyogenic microbe.

When the mucous surfaces are attacked by inflammation, it is called Mucous inflammation, and may follow three types. When any mucous surface is attacked by inflammation, causing an increased amount of mucous to be secreted (as in a bad cold), it is called Mucous Catarrhal inflammation; if this goes on to the formation of pus it is called Suppurative Mucous inflammation, and when a membrane is formed on the mucous surface it is called Croupous inflammation. This form often attacks the nose and bladder, but is best seen in diphtheria. There is no difference between Membranous Croup and Diphtheria, both are due to a germ which produces the membrane by coagulating the fibrin of the blood.

LECTURE VII.

INFLAMMATION.—Continued.

Treatment.—The principle method of treatment of inflammation a generation ago was the so-called Antiphlogistic treatment. This method was based on the phlogistic theory, which was that inflammation was an inflammable condition of the tissues, and must, therefore, be treated by depleting the system, which was accomplished by vivisection, cupping, leeching and the administration of emetics and purgatives. These remedies are used at the present

time, but not with the same end in view, as we now understand the cause of inflammation, which the older surgeons were ignorant of. The Antiphlogistic treatment has now almost entirely been succeeded by the Antiseptic treatment, which has the advantage of dealing directly with the cause of the inflammation, which is a germ. The Modern treatment can be divided into the Prophylactic and Curative. The former is prevention of infection, which is accomplished by the surgeon having his hands, instruments and dressings aseptic. The latter is the application of remedies where bacterial infection has already taken place and may be divided into Local and Constitutional.

Local Treatment.—This consist in the application of remedies with the view of relieving pain, lessening the swelling and as soothing applications. 1. Bleeding. Venesection was very much practiced in the antiphlogistic treatment, but is scarcely ever resorted to now, for by bleeding the arterial tension is diminished, and so the "*vis-a-tergo*," thereby lessening the chance of a favorable termination by resolution. Direct abstraction of blood may, under certain conditions, be used to advantage; when the inflammation is superficial and the part tense and swollen, it relieves the pain by lessening the pressure, but should only be resorted to in the stage of Hyperaemia. Leeches were at one time used, but on account of the liability of their infecting the wound they are no longer used. The safest way of abstracting blood is to cut down to the capillaries with a clean scalpel, and then increase the flow by cupping or by the application of warm antiseptic solutions.

2. Counter irritants. These are useful in some cases, especially when the inflammation is of a chronic variety. The remedies most frequently used are Tr. Iodine, Actual cautery and blisters. These remedies were largely used in the antiphlogistic treatment, but are rarely used at the present time.

3. Compression. This is a valuable remedy in the treatment of both the early and late stages; it must be applied, however, in the acute stage with great care, as sloughing or even gangrene may be the result of tight bandages on a part when the circulation is already enfeebled by injury, but if properly applied it restrains the tendency to excessive swelling and to the collection of serous or bloody discharges between the lips of the wound. In the late or

chronic stage, it is the best remedy we possess to promote absorption and resolution. A most efficient means of obtaining compression of a part, especially the knee joint, is compressed sponges. Two coarse sponges may be flattened over night under a heavy piece of furniture, one of them is then applied to each side of the joint, which is put on a posterior splint, a long cotton bandage is then applied, after which a stream of water is allowed to trickle on the sponges, which makes them swell and so causing compression.

4. Cold. Cold is useful in certain stages and harmful in others. It is only useful in the early stages, when the vessels are dilated and slightly obstructed, and still more appropriate when the inflammation is superficial. It produces constriction of the vessels and also has an inhibatory influence on the bacteria. It should never be used in the later stage, as it interferes with the formation of the collateral circulation and produces pain and discomfort. It may be applied either by evaporating lotions or by the use of ice, applied either in a rubber bag or by the coil, by which a current of ice water is allowed to flow through a rubber or metal coil over the part. Care must be taken to avoid freezing and thus causing sloughing.

5. Heat. Heat acts as a counter-irritant and also on the circulation, relieving stasis and favoring absorption of the exudation. Poultices have been discarded in the treatment of open wounds and, in fact, are seldom ever used at the present time. Heat is now applied as antiseptic fomentations of bichloride mercury, carbolic acid, etc., if the inflammation is not extensive and there is no other contraindication, but in old people with extensive inflammation, we use a less poisonous drug, as boracic acid. Wring out a piece of flannel from the hot solutions, apply to the part, place over it a piece of oil silk, which holds the heat. In this you have all the good qualities of a poultice and do away with its disadvantages—poultices are hot beds for bacteria.

6. Elevation. By elevation through the force of gravity the circulation from the inflamed point is assisted and the supply of blood regulated, in this manner the pain and swelling is relieved. This is especially useful in inflammation of the extremities.

7. Physiological rest. This is a most important indication. In

inflammation of the stomach, when food can't be retained or digested, it is best to give food by enema and let the stomach rest. In inflammation of the pleura, strap the side with adhesive plaster. In joint inflammation apply a splint. A chronic cystitis may be cured by cystotomy after all other remedies fail.

8. Parenchymatous injection. This method of treatment has been suggested to arrest the progress of the germ. It consists of injecting into the part inflamed an antiseptic solution, as carbolic acid in 3 per cent. strength, and the amount injected to be regulated by the internal dose. It is a dangerous treatment and not much employed.

9. Massage. This consist in rubbing, kneading and manipulating the part. If used, a skillful operator should be employed. It can only be used in chronic cases, as in acute inflammation the pain would be too great. Medicated ointments may be rubbed in, and are of value; a solution of Iodide of Potassium in alcohol and some oily substance is recommended. This treatment stimulates the tissues and vessels, and also aids in the absorption of the inflammatory products.

Constitutional Treatment.—It is essential to remember that local treatment, whatever its nature may be, is not the only method to be employed to restore your patient to health, and a careful surgeon will always pay due attention to the general health of his patient and will not let the presence of organic disease elsewhere be undiscovered. By the use of constitutional remedies you assist nature in subduing the inflammation.

1. Stimulants. Instead of the old-time treatment, when inflammation and fevers were starved, it is now the accepted method to stimulate and build up the patient in every possible way. Stimulants, such as whiskey, champagne and sherry, can be administered from the onset of an acute inflammation, unless the patient is sinking rapidly, when musk or camphor is best, acting quicker than the former. In chronic types, and when the stomach refuses the above, use beer, ale, etc. Stimulants must be given in doses large enough to have a decided action. They are especially useful in fevers to sustain the strength, as well as in chronic wasting disease. In these diseases stimulants, such as whiskey beer and ale, act as food, and it is well to note that they can be taken in larger quantities than in health.

2. Antipyretics. These drugs, such as Antipyrine, Phenacetine, etc., may somewhat subdue the temperature, but they also have a depressing action on the heart, and are, therefore, little used in inflammation. The best means to lower the temperature is by the use of baths, baths not only lower the temperature, but are refreshing, stimulating and also favor the removal of the poisons excreted by the skin.

3. Purgatives. Purgatives were freely used in the Antiphlogistic treatment, and are still found valuable in certain forms of inflammation. They are a part of the routine treatment of head injuries, and if administered promptly in coma, following these injuries or in apoplexy, they are supposed to remove sources of irritation and to leave the system in a condition unfavorable to meningeal or cerebral inflammation. Six grains of calomel placed on the tongue and followed in two hours by an aloes enemata (Powd. aloes one drachm to one pint of soapsuds). Such a mode of treatment is supposed to exert a derivative action by means of which irritation is removed from the brain and its coverings to distant parts of the economy. The tendency to hyperaemia is certainly diminished. The treatment of peritonitis by purgatives, particularly after a laporotomy, has recently come into vogue. They seem to relieve the tympanitis, and by their production of watery stools relieves the engorgement of the intestinal blood vessels, and they also eliminate the germs or their toxins by causing the emptier vessels to absorb the peritoneal exudates. The drugs used are calomel, Epsom salts and Seidlitz powders.

4. Diaphoretics. Although but little used in surgery, diaphoretics may be found of value, owing to their antipyretic action. They also assist the elimination of poisons by the skin, and as a good many of them are also diuretics they increase the action of kidneys. Sweet Spirits of Nitre and water are the remedies principally used.

5. Emetics. Emetics have long since been discarded in the treatment of inflammation, but were used freely in the antiphlogistic treatment.

6. Anodynes. The use of anodynes in chronic inflammation, where the pain is severe and recovery not looked for immediately, should be with caution, as there is danger of the patient using the

drug habitually after recovery. They are of great service, as they relieve the pain, which is the worst symptom of inflammation. Morphine is a good preparation to use. The most satisfactory mixture for inflammation of the brain is Chloral and Bromide of potassium in camphorated oil.

7. Diet. The diet is of the greatest importance. The patient should have plenty of highly nitrogenous and easily digested food, so as to retain his strength. Give a liquid diet, such as animal broth, beef tea and milk, if the digestion is impaired, otherwise give beef steak and eggs. When the stomach can't retain food, give by rectum every four hours, four ounces of peptonized beef juice.

8. Tonics. Quinine, Tinct. Iron, Tinct. Nux Vomica and Strychnine are used, and are of great value.

9. Specifics. When syphilis is the cause of the inflammation, give Mercury and Iodide of Potash.

℞

Hydrargyri Bichlor Cor.		griss (½)
Potassi Iodid		ʒiii (3)
Tr. Gentianae Comp.		℥ii (2)
Aq Dest	qs ad	℥iv (4)
M.		

Sig.: Two teaspoonfuls after meals. When rheumatism is the cause give salicylate of soda and bicarbonate of potassium. When tuberculosis is the cause give Arsenite of Iron, Syr. Iodide Iron and Cod Liver oil, pure, if patient can assimulate it.

LECTURE VIII.

PROCESS OF REPAIR.

Regeneration.—Regeneration consists of the process by which normal physiological waste is repaired and by which defects in tissues due to injury are restored. It is divided into Physiological and

Surgical regeneration. Physiological regeneration is the process by which normal physiological waste is repaired. We learn, from the study of Physiology, that the cells of the body do not have long life (some authors claim that the body is reconstructed every seven years), so after a certain time the cells die and are rubbed off from the body; this is well seen in the palm of the hands and the cells of the internal organs, as the liver, which from arduous labor, die and are cast off. Now, if there was no way in which the cells could be replaced, the body would soon become shrunkened, but nature provides for this, and by a process of regeneration new cells supply the waste. In early life the cell construction is in excess of the waste, and the body consequently grows; in adult life the processes are equal and the size of the body remains the same, and in old age the waste exceeds the construction and the body atrophies. Surgical regeneration consists of the process by which defects in tissue due to injury are repaired. We must make a sharp distinction between surgical regeneration and Inflammation. It was formerly thought that inflammation was necessary for the healing of a wound; this is absurd, as under aseptic treatment a wound will heal without inflammation. Regeneration is a physiological process; Inflammation is a pathological process; Surgical regeneration is a building up or healthy process; Inflammation is a breaking down or diseased process due to micro-organisms, while surgical regeneration is due to the effort of nature to resist disease and to overcome injury, and the effort is retarded by inflammation.

Process of Repair in Wounds.—Remembering the explanation of the death cells, how they perform their work, are worn out from the arduous labor and are cast off, it will be well here to study how these cells are replaced. In every organ and structure of the body there are found what are called "*Fixed tissue cells*," these cells perform no work, have no function, but simply proliferates and forms new cells with functions according to whether they were developed from the fixed tissue cells of the Hypoblast, Mesoblast or Epiblast. In bone we have cells with functions called Sarcoblastic, and we also have cells without functions which form new bone cells and are called Osteoblastic. In connective tissue, which binds different organs together, we also find cells which do

not bind, but simply proliferates and forms new cells, these fixed cells are called Epiblastic. Wounds heal by the proliferation of these fixed cells. At one time it was thought that the leucocytes, which were found in such numbers in the injured part, were converted into new tissue, this is not so, the leucocytes have no power of forming new tissue, but they do give a substance "*Fibrin ferment*," which is glutinous and holds the lips of the wound together (sutures are used to assist the leucocytes), and the leucocytes, composed as they are of proteid material, on its death deposits this nutriment, and the fixed cells use it as food, and this is the only way they assist in the formation of new cells.

Granulation.—Granulation is the process by which new tissue cells are formed in a wound to close the gap, and in the result of the proliferation of the fixed tissue cells of the part. If a cut is made, say in the leg, the lips of the wound retracts and the space is filled up with granulation, which is a prodigy of the fixed cells. This granulation tissue will be formed until the gap is entirely filled up and there is no further need for more.

Vascularization.—This is a process by which new blood vessels are formed in the granulation tissue. When a wound is made the fixed cells forms a coat over it about one-sixteenth of an inch thick, and unless this coat is supplied with blood the growth is stopped, but nature provides this blood supply. The new vessels are formed from the nearest blood vessel to the part. The first change noticed is the vessel becomes congested and four or five wedge shaped projections form on it, the base of the wedge turned toward the vessel and the apex toward the granulation tissue. The wedge increases in size and begins to be hollowed out at its base, the apex of one wedge next joins the apex of another wedge and thus capillary loops are formed all through the new tissue. These blood vessels are not permanent, for as the granulation cells become converted into more mature tissue and can exist without these vessels, the tissues contract and obliterates them.

Cicatrization.—Cicatrization is the conversion of granulation cells into more mature tissue. A bone cell in proliferating begets a bone cell, a muscle cell begets a muscle cell; so we may say that all cells breed true. If a wound be in a muscle the granulation cells are a prodigy of the fixed muscle cells, and when by

cicatrization they become mature they will have all the characteristic properties of a muscle cell; the same can be said of bone epithelia cells, etc. With the development of more mature tissue from granulation cells by cicatrization, a certain amount of contraction occurs, due to the fact that in all granulation tissue a certain amount of connective tissue is formed, this contraction forms the cicatrix and serves a good purpose of making the cicatrix smaller and by obliterating the blood vessels. The contraction may go so far as to be dangerous, as around the elbow joint it may contract to such a degree as to render the joint useless and deformed.

Epidermization.—This is the process by which a wound is covered and is the result of the proliferation of the fixed cells at the margin of the wound. After granulation and cicatrization has taken place, these cells may be seen coming from the edge of the wound, they are pale and look like the skin of an egg. If a piece of epithelium is left in the wound, proliferation will take place from it also.

Classification of Healing Wounds.—Old division:

1. Direct or immediate union.
2. Plastic inflammation.
3. Suppurative inflammation.

This classification was given by John Hunter. He thought when the surface of wounds were brought together they immediately healed; he also thought a wound healed by plastic or suppurative inflammation. Under our present knowledge this theory is absurd, as we know inflammation retards healing.

New division:

1. Primary intention (aseptic wound).
2. Secondary intention (infected wound).

This classification is proven by observation. All wounds heal by regeneration. A wound healing without inflammation is said to heal by primary intention and is always an aseptic wound. A wound healing after inflammation is said to heal by secondary intention and is always an infected wound.

LECTURE IX.

REGENERATION OF SPECIAL TISSUES.

Vegetative Capacity of Tissue.—Tissues differ from one another in their rapidity of healing, some heal quickly, others slowly, and on this is based their vegetative capacity, which means the power the tissue has of healing. Tissues that heal quickly are said to have a high vegetative capacity, and those that heal slowly are said to be of low vegetative capacity. Muscles are of a lower vegetative capacity than the epidermis, and so they differ all over the body. The vegetative capacity of tissues depends on two conditions: 1. On the kind of cell developed from, the lower the cell developed from the higher the vegetative capacity, and the higher the cell developed from the lower the vegetative capacity, as, for illustration, the vegetative capacity of a rabbit's tissues are higher than that of a man, because the rabbit is of a lower development, and a wound on the rabbit will heal quicker than on a man. 2. Blood supply: the vegetative capacity is higher the more bountiful the blood supply, and tissues with a poor blood supply have a low vegetative capacity. The nervous tissue is the most highly developed tissue in man, and is consequently of low vegetative capacity; epithelium is of low development and of a high vegetative capacity.

Cornea.—When a cut is made in the cornea or any other part, with a poor blood supply and of a low vegetative capacity, it is important to know how the wound will heal so as to be able to give a prognosis. The cornea is composed of cells placed in a transparent, homogeneous matrix; the vegetative capacity is low on account of its being a tissue of high development and with a poor blood supply. Repair is due to the proliferation of its fixed tissue cells. If examined under the microscope there will be seen cells which differ from the regular corneal cells, these are the fixed tissue cells, and when the cornea is injured they proliferate and replace the injured cells. If the wound be aseptic there will be formed just enough cells to repair the injury; cicatrization takes

place and the eye returns to its normal appearance with the sight uninjured, but if the pyogenic germ be implanted, which causes the proliferation to go on in excess, the new cells will never be able to transmit light.

Treatment. The first step is to make the wound aseptic; this is hard to do on account of its communication with the nose. Irrigate the wound, wash off the conjunctiva and eyelids, flush out the lachrymal duct through the nose, remove all blood clots and foreign bodies with a clean needle, press the lips of the wound together and bandage the eye up tight enough to hold them in apposition. Never suture the lips together.

Cartilage.—There are three kinds of cartilage—Hyaline, Fibrous and Yellow elastic. In each instance they are made up of cartilage cells placed in a homogeneous matrix. Cartilage, although not a highly developed tissue, is of a low, vegetative capacity, on account of its very poor blood supply. The injury may last a long time on account of its low vegetative capacity, but it has fixed cells, which finally proliferate and heals the wound. New blood vessels are formed from the vessels in the perichondrium.

Treatment. Render the part aseptic, immobilize it and give nature a chance.

Epidermis.—The epidermis consists of the epiderma and the derma. The epiderma is divided into four layers. It is a non-vascular tissue, composed of striated epithelia cells, but the relation to the adjacent vascular tissue is so intimate that it may be regarded as a vascular tissue with a high vegetative capacity, consequently it heals readily. Repair takes place by the proliferation of the fixed tissue cells of the part, and is entirely from the margin of the wound, as epithelia begets epithelia cells, and the skin around the wound is the nearest from which proliferation can take place. The new cells are pale, resembling the skin of an egg. The time taken to cover the wounded surface depends on the size of the wound; if the surface be large, the time may be indefinite, as in cancer of the face where the surface is large it necessarily takes a long time and often it is never covered, for after a long time the process of proliferation stops on account of the cells becoming exhausted, when a hard callous will form on the edge of the wound and all signs of healing disappears and you then have

an Ulcer to deal with. A wound with a small surface is soon covered.

Treatment.—Up to a few years ago a wound like the first described above, without vitality, was a bugbear to the surgeon, the treatment was to give nature a rest, protect the wound and to build up the patient's general health. The treatment of to day is different, we do not wait for nature, but force the wound to heal by a process called Skin Grafting, which consists of taking skin from other parts of the body and implanting it on the wounded surface, when by its proliferation the surface is covered. We have two methods of skin grafting, which are generally accepted, Reverdin's and Thiersch's; both methods are in general use, both have their advantages and advocates. They are used under two different circumstances, when a wound fails to heal and when a wound is inflicted.

Reverdin's Method.—The wound having had all hemorrhage stopped by means of pressure, is flushed off with normal saline solution. Then the skin on another portion of the body or from some other person is rendered aseptic; with a clean needle lift up the skin and with a sharp sterile scalpel cut off numerous small specks of skin and carry them to the wound by means of a needle, place them on the wound about one-third of an inch apart, with a knowledge that about two-thirds of your grafts will grow and proliferate and so complete the epidermization of the part.

Thiersch's Method.—This operation is much more heroic. Instead of taking infinitesimal pieces, he takes slips about three-quarters of an inch wide and places them on the wound. After the wound has been prepared, the skin on another portion of the body is made aseptic and slips are shaved off with a razor; these are laid on the wound side by side, with their edges touching and a protective dressing is applied. A wound which would not have healed in three or four months can be made to heal by this operation in two weeks. The skin of a friend or of a fresh cadaver can be used. Reverdin's method can be used without anæsthesia, but it is best to administer some anæsthetic in using Thiersch's method.

Connective Tissue.—This tissue has an abundant supply of blood and is of a high vegetative capacity. It embraces both white and yellow elastic tissue. It heals by proliferation of its fixed tissue cells and needs no special treatment.

Muscles.—Muscles are of two kinds—Striped and Unstriped. The striped muscles constitute the muscles of the skeleton and are under the control of the will. Unstriped constitute the muscles of the internal organs, as the stomach and intestines, and are not under the control of the will. Unstriped muscles consist of fusiform cells containing a nucleus and nucleolus. The cells are imbricated and in broad sheets, which envelopes such organs as the stomach, etc. When injured, regeneration takes place by proliferation of its fixed tissue cells by Karyokinesis, which goes on very readily.

Striped muscles are much more common, as Biceps, Triceps, etc. They are invested by fascia and divided into bundles by the Perimysium and into smaller bundles by the Endomysium and the fibres are invested by the Sarcolemma. Between the sarcolemma and the fibre at various intervals you find the fixed tissue cells, these cells when the muscle is injured proliferates, burst through the sarcolemma and then they divide and sub-divide until the injury is repaired.

Treatment.—When a large muscle is cut, especially if it is cut transversely, it is your duty to suture the ends together, as much so as it is your duty to reduce a fractured bone. Unless you suture the muscle it will be useless to the patient. If the ends retract, and it is difficult to get them together or even to reach them, don't hesitate to make the wound larger. After getting the ends relax the muscle by position (if it is the biceps flex the forearm on the arm), bring the ends together and suture them, using the Mattress suture. Suture the fascia separately.

Tendon.—Tendons are composed of white fibrous tissue. They are much smaller than muscles, but a great deal stronger; in fact, it is the strongest tissue in the body. One end of a tendon is attached to bone, the other end to muscle, they thus make locomotion easy and economize space. Tendons are sometimes ruptured or cut, and the loss of their continuity means the loss of the use of the muscle it is attached to, unless the fixed cells proliferate and fill the gap. A tendon when cut, should be invariably sutured, and when called to a case and on arriving find the wound has closed, don't just bind the part up and leave, but find out the extent of the injury, and if any tendons are cut suture them to-

gether and be sure you get the right ends in opposition; use the simple suture. Suppose a case comes to you after being injured six months and tells you one of the tendons to his finger has been cut and has not grown together, don't send the patient away, dissect down on the tendon, get the ends and splice them so as make them long enough; sever the tendon half way through about one inch from each end, split it down near to the end and turn end to end and suture, and you will get a nice result.

LECTURE X.

REGENERATION OF SPECIAL TISSUES.—Continued.

Blood Vessels.—This term includes all three types of blood vessels, Arteries, Veins and Capillaries, the structure of each has been considered before. Blood vessels are of a high vegetative capacity, nature recognizing the necessity for their rapid repair when injured so endowed them. When a blood vessel is cut the tunica intima and tunica media firmly adhere to each other, they then retract from the tunica adventitia and their edges turn inward. The blood passing over their edges coagulates and forms a thrombus on their inner side, thereby stopping the flow of blood. The thrombus thus formed is a temporary affair, as it is soon absorbed, but before it is absorbed nature heals the vessel permanently by the proliferation of the fixed tissue cells of the tunica media, which are called Angioblast, and a permanent cicatrix is formed. Up to ten or fifteen years ago the process was not understood; it was thought it was caused by the organization of the thrombus, but this is not true, the law of regeneration from the fixed tissue cells holds good here as in any portion of the body. The older surgeons had the complication of secondary hemorrhage to deal with, they would on amputating a leg, tie the arteries and put the patient to bed, thinking he was all right, but in five or six days secondary hemorrhage would come on, due to the wound being infected from

using dirty ligatures, the thrombus would disintegrate and the patient's life put at hazards. Wounds in olden times were always infected and never healed by primary intention. With our modern aseptic surgery we are never bothered with secondary hemorrhage, so let this be your motto. "*Be clean.*"

Treatment.—The subject of hemorrhage is a big one, and can't be treated of fully here. When the hemorrhage is slight, control it with very hot solutions, which cause coagulation, or by pressure or elevation, but when a large artery is cut, you must ligate it; ligate both ends, even if it is only bleeding from one, for when reaction comes on you are liable to have hemorrhage from the end which did not bleed while the heart was depressed. If the artery is only cut half in two, complete the division and tie both ends.

Nerves.—The nervous system is divided into two great divisions, Central and Peripheral. The nervous system is likened unto a telegraphic system; you have a central station represented by the brain and spinal cord, and the wires leading from the central station represent the peripheral nerves. The central system is very complex, and being of high development, it is of low vegetative capacity, and, therefore when injured, it heals slowly. The peripheral nerves are of a high vegetative capacity. They are composed of the fibre enclosed in the endoneurium, the fibres are in bundles surrounded by the perineurium and the bundles are grouped together and surrounded by the epineurium. The nerve fibre is composed of the axiscylinder enclosed in the axillemma, this is surrounded by the white substance of Schwann, and this is surrounded by the neurilemma. At variable intervals along the fibre, there are seen constrictions, called the Nodes of Ranvier, and at this point between the neurilemma and the white substance of Schwann we find the fixed tissue cells called Neuroblast, and by their proliferation injuries to the nerves are repaired.

Treatment.—Cruickshank was the first experimenter to try suturing the ends of divided nerves together, but he did not succeed on account of the ignorance existing in his days in regard to asepsis. It is now employed successfully in every day practice, and you had just as well leave the ends of a broken bone unapproximated as to leave a divided nerve unsutured. Nerves, when immediately cut, can be easily sutured, and their function will be restored in forty-

eight hours. Never use the regular surgical needle with sharp edges in suturing a nerve, use the common cambric needle, employing an aseptic suture of catgut or silk. The operation was at first thought to be very painful, but if it is done aseptically, it does not give rise to much pain. If you find it necessary suture the perineurial sheath with a separate suture.

Sometimes a patient will come to you and say he has lost all sensation in one of his limbs, and on inquiry you find out that in some previous operation or by a fractured bone the nerve has been severed and has not grown together. What will you do? Do this, perform a secondary operation; render the part bloodless by using a tourniquet, make the limb, your hands and instruments sterile, dissect down and find the ends of the nerve, clip off their bulbous extremities and practice either of these methods: "*Sutures a distance*," in this the sutures form a scaffolding for the new cells, the sutures are run from one cut end of the nerve to the other, and the new cells are, as it were, carried across on a bridge from one end of the nerve to the other until the breach in its continuity is mended; or you can use the second method, take a chicken bone tube, saw off the ends, decalsify it and make aseptic, put the ends of the nerve in the tube and sew up the wound; the hollow bone causes the cells to proliferate toward the breach until it is finally mended. Nerve grafting up to this time has not succeeded.

Bone.—Bone forms the skeleton or framework of the body, it is the hardest structure in the body, being composed of both animal and mineral matter. Most all bones are hollow internally and coated by a membrane called the Endosteum. Externally they are coated by a membrane called the Periosteum. Bones have canals running all through them called Haversion canals, these canals are surrounded by spaces called Lacunae, which communicate with each other and the Haversion canals by minute channels called Canaliculi. In the periosteum, endosteum and lacunae are round cells called osteoblast, which are put there to repair normal physiological waste, but when the bone is injured they take on greater vitality and repair the injury by pouring out granulations called Callus. When first formed the callus is soft and elastic, but after cicatrization occurs the soft uncharacteristic cells become converted into hard bone cells. More callus is formed than is

necessary to mend the breach, this will be understocd after the process is described. When a bone is broken the osteoblast of the periosteum proliferates and forms callus on the outside, this is called External or splint callus; the osteoblast of the endosteum proliferates and forms callus in the medullary cavity, which is called Internal or Pin callus, and the osteoblast of the lacunae proliferates and forms callus between the divided ends, this is called Intermediate or Definitive callus. The callus in each place is thrown out in abundance, the external callus acting as a splint, the internal as a pin, and the intermediate, which is permanent, heals the breach. The internal and external callus after performing their purpose is absorbed.

Sometimes the callus, owing to some constitutional or local trouble, is formed in excessive amounts, this may be due to syphilis, tuberculosis or to the bone not being immovably fixed, and when it occurs the seat of the fracture is the seat of a tumor, which feels like a hard lump. The treatment of the above should be the administration of antisyphilitic remedies, absolute immobility of the bones and confine the patient to bed. Again, callus may be deficit in amount, and this again is due to syphilis, tuberculosis, old age and insufficient blood supply. When the bone is examined you will find no swelling or anything to show that healing has commenced. The treatment should be directed toward building up the patient's general health; irrigate and thus stimulate the cells to proliferate, this can be done by rubbing the ends together. If this does not effect a union, give the patient an anæsthetic, render everything aseptic, open the limb down to the seat of the fracture, saw off the ends of the bone, drill a hole in each end and fasten them together with a bone nail. The most satisfactory operation is the Step operation, in this the bone is sawed like a step, each end having a shoulder which fits quite accurately, it is then held in position with silver wire.

It is a practical fact that when a bone is removed from any part of the body that if the periosteum is left the bone will regenerate from it. A case is reported where the entire collar bone was removed and the periosteum left, whereas the entire bone was restored in two or three months. Theoretically it is claimed that unless a small piece of bone is left the bone will not regenerate, but it will,

provided the wound be aseptic, the periosteum sewed up and slightly irrigated.

Treatment of Fractures.—There are two indications when a fracture occurs, reduce the fracture and keep the fragments in apposition by some mechanical appliance.

LECTURE XI.

SUPPURATION.

Suppuration may be defined as the process by which the products of inflammation are converted into pus. For many years the phenomena was not understood. About thirty years ago an experimenter, while examining pus, saw between and in the pus corpuscles certain minute round bodies, but was unable to explain anything about them. Koch, working on the same line, said he believed they were micro-organisms, and by further investigation he proved that they were germs and not products of inflammation. It is now generally accepted that suppuration is due to a specific germ, and moreover, it can be proven by fulfilling the laws of Koch. These bacteria always accompany suppuration; they can be cultivated; the cultivated germs if injected into an animal will cause suppuration; they will be found in the pus from this animal. It can also be proven clinically as well as bacteriologically that it is due to a germ; if you make a wound clean, it will heal without suppuration, whereas in a dirty wound you invariably have suppuration. After a wound has suppurated by heroic treatment with strong antiseptics, you can kill the germs and suppuration at once ceases.

Causes.—The causes of suppuration may be divided into predisposing and essential.

1. Predisposing.—Diminished vitality of the tissues. If any part of the body is congested or inflamed, or for any reason is de-

pressed, you have a weak point where the germ may localize and cause suppuration.

Anatomical structure of the part.—Some structures are more liable to suppuration than others; this is explained by the fact that some organs, for instance the liver, has terminal distribution of arteries, these arteries end bluntly and do not anastomose as in other parts, and consequently when they become plugged they have no means of establishing a collateral circulation, and as a result, it is more liable to suppuration than parts where the vessels anastomose freely.

Condition of the blood.—If from any debilitating diseases, as anemia or diabetes, the character of the blood is below par, suppuration is liable to occur. This is well seen in Diabetes, when sugar circulates freely in the blood, with the result of superficial abscesses all over the body.

Number of germs introduced.—An investigator has recently made a solution of the germs of suppuration, in which he knew how many germs there were to the drop of the solution, and by injecting this solution into animals he found out how many of the germs it took to produce suppuration. Each drop of the solution represented eighteen million germs. Into one animal he injected one drop, another two and another three, but in none of the animals did suppuration occur, but when he injected them in quantities amounting to one billion germs suppuration occurred. The action of the white corpuscles or phagocytes explains this. The phagocytes were able to cope with from eighteen to thirty-six millions of the germs, and prevented their producing suppuration, but when a billion were injected they overcame the phagocytes and produced their effect.

2. Essential cause.—The essential cause is the microbe of suppuration, of which we recognize about fifteen varieties.

Staphylococcus pyogenes aureus.— As the name indicates this is a round cell, about 1 MM. in diameter, grows in agar agar, blood serum and glycerin, multiplies by direct division and forms bunches. Its peculiarity is that when growing it imparts an orange color to the fluids.

Staphylococcus pyogenes albus.—This is also a round cell, and is only differentiated from the above by its imparting a white appearance to the media.

Staphylococcus pyogenes citreus.—This germ is identical in size and shape with the above and grows in the same media. Its distinctive feature is that it imparts a very dark orange color to the media in which it is cultivated.

Staphylococcus cereus albus.—This is a slightly smaller cocci than the preceding, but otherwise is identical. When growing it forms round, waxy white bodies, sometimes spoken of as its eggs.

Staphylococcus cereus flavus.—This cocci is identical with the above, with the exception that the bodies formed are round, waxy and yellow.

Staphylococcus flavescens.—This cocci has no distinctive feature, it stands midway between the staphylococcus cereus albus and flavus. It is said to cause stitch hole suppuration. It is found principally on the fingers. It multiplies very rapidly and forms bunches.

Micrococcus pyogenes tenius.—This germ has only recently been discovered. It is found in abscesses which do not cause any marked constitutional disturbances.

Streptococcus pyogenes.—This is the most important specie of all the germs of suppuration. It is a round cocci, mutiplies by fission and forms chains, it multiplies slowly at the ordinary temperatures, but very rapidly above these temperatures. It imparts a brown hue to the media.

Bacillus pyogenes fetidus.—This is a rod shaped germ with round ends, possessing two nuclei. It imparts a stinking odor to the media. It is to this bacillus that the stink which is characteristic of abscesses in the vagina is due.

Bacillus pyocyaneus.—This is a rod-shaped germ with rounded ends with but one nuclei. It is charactrized by imparting a dark blue color to the media. The blue granulations of an infected wound is due to this bacillus.

Micrococcus Gonorrhœa.—This is a round cocci usually found in pairs forming a Diplococci. It is found chiefly on mucus membranes.

Bacillus Coli Communis.—This is a rod-shaped germ with blunt ends possessing one nuclei. It grows in all media, but does not liquify it. These bacilli inhabit the intestines, and are supposed to assist digestion, but if any lesion occurs in the intestines and

they get into the peritoneal cavity they will produce peritonitis. They are harmless while in the intestinal canal. They are said to be the cause of appendicitis, the appendix becomes predisposed, owing to defective blood supply, the bacilli infects it, causing suppurative appendicitis.

In the practice of surgery you will find that suppuration behaves differently on different occasions, sometimes, as in an abscess, it is localized and on opening the abscess the suppuration ceases, again it has no tendency to localize, but grows worse. This difference is due to the peculiar character of the germ causing the suppuration. All the staphylococci cause localized suppuration, while the streptococci produce diffuse suppuration. Recently there has been claimed by some scientist and enemies of bacteriology, that suppuration can be produced without the pyogenic germ; one of them took a glass tube, sterilized it and inserted into it some sterilized croton oil and then sewed it in his arm, he claimed that suppuration was produced. It is true, he produced something like pus, but it was not pus, it was a travesty and was a puruloid and not a purulent material. Clinically all pus is produced by a specific germ.

Pus.—Pus is the by-product of suppurative inflammation. It is a thick, milky, cream-like fluid, having little odor, slightly alkaline in reaction, specific gravity 1030. It is composed of pus serum and pus corpuscles. Pus serum consists of the top layer of pus after it stands awhile. It is a clear, transparent, greenish yellow fluid, alkaline in reaction and resembles and is almost identical in chemical composition with liquor sanguinis. Pus corpuscles form the solid element. They are simply dead lencocytes and embryonal cells. They vary in size according to their source, those formed from the lencocytes are the size of the lencocytes and those from the embryonal cells are the size of the embryonal cells. They are usually round, but are sometimes very fantastic, this is caused by the leucocytes in death's agony throwing out pseudopodia in vain attempts to protect itself, rigor mortis coming on and catching it in this shape. The appearance of their protoplasm is granular; an ordinary leucocytes or embryonal cell is clear and transparent, but on their death putrefaction sets in and gives them a granular appearance. The lencocytes and embryonal cells have

only one nuclei, pus corpuscles have about fifteen, and it is on this account that some observers claim them to be living cells, and the great number of nuclei are due to the division of their original nucleus, but it has been proven that they are not a result of reproduction, but of disintegration, and so not an evidence of construction, but of destruction. Acetic acid added to pus corpuscles causes them to become clear and transparent; water causes them to swell; liquor potassae at once destroys them by converting them into a gelatinous mass.

Clinical Varieties.—*1. Laudible pus.*—This means a good or healthy pus, but the idea of saying any pus is good or healthy is absurd; but the name has been in use so long that it is hard to discard it. It means the best pus out of a bad assortment. It is thick, creamy, white pus, without odor, not irritating and soon ceases, leaving a healthy granulation.

2. Sanious pus. —This means pus stained with blood. It is thin, acrid, irritating and of a dark red color, and indicates serious consequences.

3. Fetid pus.—This means stinking pus. It is commonly found in abscesses near the rectum and in the vagina.

4. Chromatic pus.—This means a brilliantly colored pus, as the dark blue pus produced by the bacillus pyocyaneus. We also sometimes see dark red pus, but the bacillus which produces it has not been named.

5. Serous pus.—This means pus mixed with serum. It is generally found near serous cavities.

6. Mucous or Muco-purulent pus.—This means pus mixed with mucous. In a bad cold you see mucous flowing from the nose, and if this goes on to a catarrhal condition the mucous becomes mixed with pus.

7. Inspissated pus.—Sometimes in splitting open an old abscess we find a caseous mass, this is called inspissated pus. It is caused by the serum of the pus being absorbed, leaving the pus corpuscles behind, which forms a dry, cheesy mass.

LECTURE XII.

CLINICAL FORMS OF SUPPURATION.

In accordance to the time taken to convert the products of inflammation into pus, suppuration is divided into Acute, sub-acute and Chronic suppuration. These terms do not mean that there are different kinds of suppuration, but are simply used to designate the intensity of the process.

Acute suppuration is caused by a germ of great virulency and in large numbers. The symptoms come on rapidly and reach their height in two or three days and then subside. In this form all the pus corpuscles are derived from the leucocytes, for the process is so rapid that not enough time is given for the embryonal cells to proliferate. The symptoms are pain, heat, redness and swelling.

Sub-acute suppuration differs from the preceding only in not being as intense, it is produced by a germ of less virulency and not in such numbers. The symptoms develop slowly and last for a longer time. The source of the pus corpuscles are from both the leucocytes and embryonal cells, as in this form time is given for the embryonal cells to proliferate. The symptoms are the same as in the acute form, but are not as intense, especially the pain.

Chronic suppuration is produced by an exceedingly attenuated germ, and these are only in small numbers. The symptoms are the same as in the other forms, but they develop more slowly, last longer and are not so intense. The pus corpuscles are exclusively of embryonal cells, as the development is so slow that the stigmata in the vessels heal and do not allow the escape of the leucocytes and those escaped in the early stage are absorbed.

Abscess.—An abscess may be defined as a circumscribed collection of pus in tissue. A collection of pus in a preformed space is not an abscess, but a purulent infiltration, as pus in the fallopian tube, peritoneal and thoracic cavity, in these cases Pyo is added to the name of the anatomical cavity as Pyothorax, etc. We have two varieties of abscesses—Acute and Chronic; this does not mean that they differ in kind, but in degree and intensity. The causes

which may produce an abscess are numerous, but only two will be considered, predisposing and essential. The predisposing cause is anything which lessens the vitality of the tissues. The essential cause is the germ of suppuration, usually of the staphylococcus variety.

Pathology.—This germ enters through an "*Infection Atrium*," penetrate the tissues (usually the cellular tissue), there rapidly increase in number, and after forming quite an army, attack the tissue, producing inflammation. They first attack the capillaries producing hyperaemia, followed by transudation and exudation; soon necrosis sets in, which is due to the evil influence of the germs and their toxins, and to starvation of the tissues, from the blood supply being cut off by pressure. After the death of the tissues, liquifaction takes place. This commences in the center and rapidly progresses, until a point is reached where nature has made preparations to protect itself. Nature does this by the cells at the margin of the diseased tissue, proliferating and building a wall of defence. As soon as the germs find they can't invade the tissue further they turn their attention entirely to the dead tissue, peptonizing it, with the result that we have a bag full of fluid pus. After while nature congratulating herself on having successfully repulsed the enemy, determines she will get them entirely off of her domains; this is accomplished by a process called "*pointing.*" The pus is gradually forced to the surface and by pressure on the skin or mucous membrane a dark spot appears, which finally breaks down and a sinus is opened through which the pus escapes.

Acute Abscess.—The acute or hot abscess usually developes in the connective tissue beneath the skin. The causes are, as before stated, predisposing (traumatism or debility) and essential, which is the germ of suppuration.

Symptoms.—The constitutional symptoms are chills, fever, anorexia and nausea, which are due to the absorption of the toxins. The local symptoms are heat, redness, swelling, pain and fluctuation. When an abscess is developing, the pain is in accordance to the number of nerves and the elasticity of the part. The swelling is due to the hyperaemia of the vessels, and to their pouring out exudations and transudations. Heat and redness is localized and due to the increased amount of blood to the part. After the above

symptoms, on careful palpation, you can detect fluctuation, which shows pus has formed. The mode of obtaining fluctuation is to place one finger on each side the swelling, and by producing unequal pressure, first with one finger then the other, a wave of fluid is set up which can be readily felt. The swelling will now be noticed to become cone shaped, the surface yellow and unless the abscess is incised ulceration takes place from pressure and the pus escapes.

Diagnosis.—This is usually simple, being made from the symptom of inflammation and fluctuation. But occasionally there is difficulty in telling if it is an abscess or an aneurism, and the two may co-exist, or it may be mistaken for a rapidly growing tumor. The use of the aspirator in these cases clears up the diagnosis. An aspirator is simply a hollow needle fitted on to a syringe. To use the aspirator, render the part aseptic, sterilize the needle by passing it through a flame, and insert it under the skin obliquely for a half an inch before entering the cavity, by this means a valve is formed, which, on withdrawing the needle, prevents the escape of the contents of the tumor. After the needle enters the cavity, which is recognized by the lack of resistance, withdraw the piston, and if it is an abscess you will get pus in the barrel of the syringe, if an aneurism you get blood, and if a tumor you will get a certain amount of serum and epithelia cells and by examining these under the microscope you can tell the kind of tumor you have to deal with.

Treatment.—The old treatment consisted in applying a poultice to the abscess until it came to a head or pointed, and then it was incised, but let me caution you, never use a poultice, it has two good qualities, moisture and heat, which can be obtained by immersing a piece of cotton in a hot antiseptic solution, applying it and covering with oil silk, which will hold the heat for hours and in this manner you get all the good qualities of a poultice and do away with its disadvantages, the chief of which is the extreme liability to infection. When you are certain there is pus in an abscess or boil, don't wait for poultices or hot fomentations to bring it near the surface, but cut down with a free incision, irrigate the cavity and drain. In cutting down into a deeply seated abscess, you must know the anatomy of the part, and if there be

large blood vessels or nerves interposed, as in an abscess of the deep tissues of the neck, don't jab your knife down into the cavity, but practice this method. After rendering the part aseptic and your hands and instruments sterile, make a small incision through the skin, then with a pair of artery forceps bore your way through the tissues down into the cavity, which, when reached, can be told by the lack of resistance; now open the forceps and thus dilate the sinus you have made; if the abscess be very large continue your boring into the opposite wall from the inside until the forceps show beneath the skin, then slightly open them and cut the skin between the blades. Irrigate the cavity with antiseptic solutions, give free drainage and put on a protective dressing.

Chronic or Cold Abscess.—These abscesses are usually tubercular in origin, the person having previously had tuberculosis of the bones or some other tissue and the bacilli floating around gets into the embryonal cells, causing a cold abscess. Their usual seat is on the back, thighs or knees.

Causes.—The predisposing cause is the existence of tuberculosis in some of the tissues, and the essential cause is the introduction of the pus germ in these tubercular areas.

Symptoms.—The local symptoms are vague and uncertain, there is no pain, redness or heat; the only symptom is swelling, which developes exceedinly slow and gives fluctuation on palpation. The constitutional symptoms are those of tuberculosis, a rise of temperature in the evening, diarrhœa, night sweats and general emaciation.

Diagnosis.— The diagnosis is based on the history; inquire into the family history, look at the spine for Pott's disease, at the hip for Coxalgia, and lastly obtain some of the fluid with an aspirator, examine it under the microscope for the Tubercle bacillus.

Treatment.—There are two principal methods of treatment—Incision and Aspiration. When the primary focus is accessible, it should be treated with a free sweeping incision, dissect out the capsule, irrigate with heroic antiseptics, such as bi-chloride of mercury, and close the wound. But if the abscess is so situated that it can't be readily gotten at, practice the second method: Take a large trocar, sterilize it by passing it through a flame and plunge it into the cavity, withdraw the blade and allow the fluid to run

out through the canula, irrigate the cavity through the canula with strong antiseptic solutions until the solutions return uncolored with pus, then inject into the cavity ℥ss to ℥i of a ten per cent. solution of Iodoform in glycerine, withdraw the canula and seal the opening with a piece of adhesive plaster to prevent the escape of the Iodoform; repeat this every two weeks. This treatment is based on the fact that by aspiration you eliminate so many of the bacilli, and by using antiseptics you kill the germs present and the iodoform prevents their further growth.

LECTURE XIII.

CLINICAL FORMS OF SUPPURATION.—Continued.

Phlegmonous Inflammation with Suppuration.—This subject is contrasted with abscesses, an abscess being a circumscribed collection of pus, while phlegmonous inflammation is characterized by its tendency to spread and is a much more serious condition. It may be defined as a rapidly spreading inflammation, accompanied by suppuration, usually involving the connective tissue of the extremities and showing no tendency to localize.

Cause.—The essential cause is the microbe of suppuration. The microbes which cause suppuration are about fifteen in number, of these the Staphylococcus are found in abscesses and the streptococcus in phlegmonous inflammation. The predisposing causes are injuries to the connective tissue of the extremities, as in crushing wounds in railroad accidents and in compound fractures.

Symptoms.—The symptoms generally come on in about four days after the injury, commencing with a chill, followed by a rapid rise of temperature, which may reach 104 to 105 degrees F., rapid bounding pulse, full respiration, skin hot and dry, the wound angry looking, a bloody, serous discharge comes from it, the tissues boggy and pitting on pressure, the swelling extends up and down the limb and the exudations are rapidly converted into pus. The pro-

cess extends along the muscles and nerves, over the arteries and veins, and when an incision is made into the tissues they look as if they had been dissected out with a knife.

Treatment.—The treatment to save life must be heroic. The pus is ground down and infiltrated into every part of the tissues, and the operation must be looked on as a major operation. Give the patient an anæsthetic, make the site of the operation clean by using hot water and green soap, alcohol and bi-chloride; make your hands and instruments sterile, and with a free incision expose all the tissues involved, follow out the course of the pus minutely, sponge the wound, irrigate with boracic or salicylic acid solution, give free drainage, apply plenty of absorbing cotton, bandage up the part and put the patient to bed. Watch the patient, and if in three or four days you find him with fever, remove the dressing and drainage tubes, lay the limb out on the bed over a piece of rubber and resort to continual irrigation. This can be done by putting a fountain syringe on the bed post, and let some feeble antiseptic solution flow over the wound. In this way you wash off the pus as fast as it is formed and thus its absorption is prevented. The current of water can be nicely regulated with a clothes pin. By feeble antiseptic solutions is meant non-poisonous solutions; our best antiseptics, bi-chloride of mercury and carbolic acid, are poisonous and can't be used on such large surfaces, and consequently we resort to feebler antiseptics, such as chloral hydrate, boracic and salicylic acid, acetate of aluminum, etc. A splendid non-poisonous antiseptic solution can be made by the addition of Tinct. Iodine to water until it assumes a cherry wine color. In extreme cases, where the above means have been resorted to and failed, amputation must be resorted to in order to save life. In amputating always operate high enough up above the infected tissue to secure a healthy flap. The operation under these conditions is extremely grave.

Paronychia.—Paronychia, whitlow or felon are syonymous terms applied to suppurative inflammation of the fingers. It may form under the skin, tendon or periosteum.

Cause.—The cause is the microbe of suppuration, it never occurs without this microbe, and if the history of the case be inquired into, it will be found that the skin has been broken by a splinter

or other means, thus giving entrance to the germ. It is seen in carpenters, cooks and surgeons very frequently.

Symptoms.—There is throbbing pain and the finger is swollen, red, hot and congested.

Treatment.—The treatment usually followed, consist of painting the finger with Iodine, or the application of a poultice, and after the doctor finds out the finger is getting worse, he jabs a knife into it, and allows the patient to do the cutting by jumping. Never be guilty of treating a case like this. The first treatment is the prophylactic; care for the nails by keeping the skin pushed well back off them, keeps the fingers free from hang nails and use antiseptics from time to time. These suggestions should invariably be carried out by surgeons.

The abortive treatment amounts to nothing, which is shown by so much having been written on the subject with still no recognized specific. But, of course, you must do something, and the following is the most logical: Keep the hand elevated and the finger enclosed in an ice bag, this keeps down excessive hyperaemia, and the cold also has a deleterious action on the microbes. If, in spite of all you do, the process goes on to suppuration, don't poultice, render the part aseptic with the usual care, use some local anæsthetic as Cocaine or Ethyl chloride spray and with a clean knife make an incision parallel with the long axis of the finger, so as not to cut the tendon in two; cut carefully as the pus may be just under the skin, and by carelessness or by letting the patient do the cutting by jumping, you may cut down to the tendon unnecessarily, or the pus may be under the periosteum and you will not reach it; so cut carefully, evacuate the pus, irrigate the cavity with a strong bi-cholride solution and dress aseptically. Flush out the cavity every two or three days until suppuration ceases.

Furuncle. —A furuncle or boil is nothing but an abscess of the skin. They are more frequently seen on the back of the neck. There may be only one or two and again they may extend all over the body, which constitutes a disease known as Furunculosis.

Cause.—The essential cause is the pus germ. The pus germ is capable of penetrating the skin in rare instances, they may gain admittance through a hair follicle or sodoriferous gland, and when

they enter by these channels they generally locate at the point of entrance, causing a furuncle.

Symptoms.—The first symptom is itching, which comes from a small blotch on the skin, this blotch grows larger and there is pain, redness, swelling and increased local temperature. The pus soon appears under the skin, stretching it upward and unless incised finally burst through and discharges.

Treatment.—The treatment formerly consisted in the administration of such drugs as Calcium sulphide, Iron, etc., which were thought to prevent their formation. This is not true, but they do good if the patient is anemic and the digestion is poor. The prophylactic treatment consists of cleanliness. Take a warm bath three or four times a week, using soap free from alkalies and perfumery; change the underclothing frequently, don't scratch the part with dirty nails and thus implant fresh infection. It this fails, give an antiseptic bath once a week of Sulpho-naphtol (℥i to a tub of water). When a furuncle does occur, try to abort it before it points by touching it with pure carbolic acid. If, however, it goes on and pus forms, don't poultice, but render the part aseptic and incise it with a clean knife. Don't try to squeeze the core out and thus bruise and weaken the vitality of the tissues, but with a small curette scoop out the necrotic tissue, irrigate with a strong carbolic acid solution and put on an aseptic dressing. If the patient be an important one, don't envelope the head in a bandage, but with a little collodion, paint around the wound and apply a piece of lint.

Carbuncle.—A carbuncle is a suppurative and gangrenous inflammation, the toxic germ which causes it is so virulent that death of the tissues result. Some authors make two classes—Malignant and Simple. The malignant pustule is due to the germ of anthrax and is distinct from a carbuncle, which is due to the microbe of suppuration. Carbuncles usually occur on the neck or buttocks, between the ages of forty and sixty. It may be from one to fourteen inches in diameter. Its characteristic feature is that it has a cribriform surface—that is, it is punctured by four or five holes, whereas a furuncle has only one and on this is based the differential diagnosis.

Symptoms.—There is throbbing pain, redness, swelling and in-

creased local temperature. It is movable and feels like a hard cartilagenous mass.

Treatment.— If the carbuncle is seen in its infancy, exterminate it. The tissues beneath are infiltrated with pus, which should be evacuated. Give an anæsthetic, shave and render the part aseptic, then make a crucial incision, dissect back the flaps and with a curette remove the necrotic tissue, clip off all dead fragments of tissue with scissors, irrigate with a bi-chloride solution and dress aseptically. Irrigate the wound daily until the process ceases. Sometimes it will be found necessary to completely exterminate the carbuncle as if you were dealing with a cancer. Go beyond the infected tissue and remove it bodily. When the above means fail, and the germ still carries on its deadly work, resort to the cautery, take a thermo-cautery and burn over the entire surface.

The constitutional treatment of all suppurations should not be neglected, give stimulants, good food, and for the pain give an anodyne.

LECTURE XIV.

CLINICAL FORMS OF SUPPURATION.—Continued.

Abscess of the Antrum.—An abscess of the antrum is a circumscribed collection of pus in the Antrum of Highmore, which cavity is situated in the Superior maxilla. This cavity opens into the nose through a small outlet, which is only covered by mucous membrane, the roots of the first molar and second bicuspid teeth usually open into it also.

Cause.—The essential cause is the pyogenic microbe, which may gain admittance through the roots of the teeth opening into it, or through the opening from the nose.

Symptoms.—The symptoms are pain which radiates over the whole face. If the pus accumulates swelling will result, and it may go on to such an extent as to cause protrusion of the thin,

bony wall, either pushing out on the face or into the orbital cavity, causing protrusion of the eyeball, and if the process continues the soft tissues also become infected. The abscess may break into the nose, discharging out of the anterior nares or posterior nares into the throat.

Diagnosis.—The diagnosis is based on the symptoms, one side of the face is swollen, the eye protrudes, percussion on the disease side gives a dull sound, while the healthy side gives a tympanitic sound. A small electrical light placed in the mouth, in a dark room with the lips closed, gives a positive diagnosis; on the healthy side the light will be diffused through the bone and a semi-lunar ring of light will show below the eye, but the light on the diseased side is obstructed and does not show below the eye.

Treatment.—The treatment must be prompt, or else disintegration will occur, causing serious loss of flesh and horrible disfigurement. If the abscess is caused by a diseased tooth, extract it, and with a gimlet or awl bore through the socket of the tooth into the cavity and let the pus escape. But if you find the teeth healthy, don't pull them out, for a surgeon has no more right to sacrifice a tooth of a patient than he has to sacrifice a limb. In this case enter the antrum through the canine fossa. Make an incision an inch above the first bicuspid tooth down to the bone, and with an awl bore through the fossa and let the pus escape. After evacuating the pus by either operation flush out the cavity and give drainage. Irrigate the cavity daily until pus stops forming. If the abscess is very extensive, continue the boring from the inside of the antrum into the nasal fossa and practice continual irrigation.

Abscess of the Liver.—This consists of a circumscribed collection of pus in liver tissue, and not as often supposed of the capsule or peritoneal covering.

Causes.—The causes are numerous. The essential cause is the pyogenic microbe, the predisposing causes are stabs, blows or contusions of the organ. The most frequent cause is tropical influences. Most of the cases seen are in people living near or having recently visited the Equator, and it is because of the extreme liability of people living in the tropics to diarrhœa and dysentery, which is caused by infected water. The diarrhœa and dysentery is followed by suppuration of the intestines, and the blood from

the intestines is carried directly to the liver and the germ is also conveyed along with it, and it lodges in the liver, forming a thrombus and an abscess results.

Symptoms. —The symptoms are very vague and indefinite. They come on at first very slowly, resembling sub-acute suppuration in character, the patient has a general feeling of depression, skin is sallow, tongue foul and coated, slight evening fever; soon night sweats come on, and there is general debility and prostration; the liver begins to enlarge, the ribs over it begin to bulge and on palpation you get fluctuation.

Diagnosis.— In order to make a diagnosis, you must get the history of the patient, whether or not he has at some previous time received a stab in the liver, if the tropics have recently been visited; then notice the appearance of the skin and face, the presence of night sweats and the liver tender and enlarged, but with all these symptoms you can't be positive in your diagnosis, so take the old axiom of surgeons, "*Never operate for suspected pus until you prove it is pus by the use of the aspirator.*" So in these cases confirm your diagnosis with the aspirator before operating. Take a small aspirating needle four or five inches long, attach it to the syringe, render the skin aseptic over the site of the operation, sterilize the needle over a flame and insert it just above the rib over which the pus is suspected, insert it freely into the liver tissue and if you do not find the pus where you suspected it, plunge the needle in other directions until you feel the lack of resistance to the needle, which indicates that it has entered the abscess, withdraw the piston and the pus will come into the barrel of the syringe. The pus from a liver abscess is peculiar, being of a dark chocolate brown color, with mucus and disintegrated liver tissue mixed with it.

Treatment. —After making a positive diagnosis of pus you must evacuate it at once, if you wait it may infiltrate the tissues and burst into the abdominal cavity, causing almost sure death. Give an anæsthetic, render the part aseptic and make a free incision, and if necessary remove a rib. When the peritoneum is reached, if you find the visceral and parietal layers adhered, you can proceed with the operation, but if they are not adhered, pack the wound with Iodoform gauze and wait a week, and by that time

they will have become adhered. The necessity of having the two layers of peritoneum adhered is to keep the pus out of the abdominal cavity. Having reached the liver, take an aspirating needle and locate the abscess, then with a pair of artery forceps bore a hole into the abscess, following the aspirating needle, dilate the hole with the forceps and with your finger break down any trabeculæ in the cavity, irrigate daily, and give complete drainage. When operated on thirty per cent. recover, whereas ninety per cent. die without the operation.

Abscess of the Breast.—This is a circumscribed collection of pus in the mammary gland.

Causes.—The essential cause is the pyogenic germs, which reach the gland in many ways. Physiological engorgement with milk or deficient abstraction of milk will cause it, as when the breast is so sore that the baby can't be allowed to nurse, and fissures on the nipple is another common cause. They are sometimes seen in men and in early life, but are more common in women soon after parturition.

Symptoms.—There is throbbing pain, a feeling of distention and tension, redness, swelling and fluctuation, and if the breast is left alone it will point and discharge. The constitutional symptons are slight chill, fever and anorexia.

Treatment.—The prophylactic treatment is the most important, and consist of the care of the breast months before delivery. Inquire into the condition of the breast, the nipple may be deeply sunken into the breast, and when the child is born it won't be able to catch it in his mouth; in this case instruct the woman to pull it out daily; again the nipples may be cracked and sore, bathe them and touch with nitrate silver and apply antiseptic solutions. After the birth of the child, see that the breast is emptied regularly, and see that the mother doesn't allow the child to nurse only from one side; wash off the nipple with a boracic acid solution after the child nurses and then dust with an antiseptic powder, such as calomel, but be sure and wash this off before allowing the child to nurse again, or you will cause, as in the case of calomel, an obstinate case of diarrhœa. When suppuration does occur, the curative treatment consist in stopping the child from nursing and in removing the milk with a breast pump. When the abscess

forms, as will be shown by the symptoms, liniments may be used to absorb the milk (a liniment of belladona is good), purge the woman with saline purgatives and give opium for the pain. As soon as possible you must evacuate the pus by making a free incision, irrigate the cavity and give free drainage. In making the incision remember your anatomy, how the tubules approach the nipple from all sides, and don't cut crosswise and sever them, thus causing a fistulous opening from which milk constantly oozes and prevents healing. Make your incision parallel with the tubes or as the spokes of a wheel are to the hub, make a large, long cut, break up the trabeculæ with your finger, irrigate daily and drain. Always remember that a large incision heals as quickly as a small one, and when operating always make your incision large, provided there is no large artery or nerve interposed.

Abscess of the Lung.—This means a circumscribed collection of pus in lung tissue and not a circumscribed collection of tubercular matter.

Cause.—The essential cause is the pyogenic microbe. The predisposing cause is anything which weakens the lung tissue, as an attack of pneumonia, which may leave a solid spot in the lung, which constitutes a "*Locus Minoris Resistentiæ.*" Or the germ may come from the air on some foreign body as a cinder.

Symptoms.—Pallid face, night sweats, cough, emaciation and expectoration. Locally we have an area of dullness, loss of lung sound, with increased vocal fremitis.

Diagnosis.—When you suspect pus never operate until you have confirmed your suspicion with the aspirator. Render the part and the needle sterile; pass the needle down in the intercostal space into the lung; you may have to aspirate in several places before finding the pus. After securing the fluid carry it to a microscopist and find out whether it is tubercular matter or pus. If it is tubercular matter don't operate, for your patient is doomed, regardless of all the new serums; but if it is pus the only hope is an early operation. You will often hear of tubercular pus, there is no such thing; pus is produced by the bacillus pyogenes and is a purilent material; tubercular matter is produced by the Tubercle bacillus and therefore distinct from pus.

Treatment.—The operation for the removal of pus from the lungs is very difficult, but although difficult it is your duty as a

surgeon to remove it and try and save life. Resect a rib, reflect the periosteum, and with bone forceps take out two or three inches of the rib, carry the dissection down to the pleura, open the pleura and the two layers will be generally found adhered, but if they are not do not continue the operation until you have made them adhere by packing the space with iodoform gauze. Don't cut down into the lung with a knife, but do your cutting with a thermo-cautery, which seals the vessels as fast as they are cut, and opens up a tunnel down to the pus, irrigate the cavity and insert a drainage tube of sufficient size to give free drainage. Flush out the cavity daily with a warm antiseptic solution.

Abscess of the Brain.—This is a circumscribed collection of pus in brain tissue.

Cause.—The essential cause is the pyogenic microbe, which reaches the brain in the majority of cases through a suppurative disease of the middle ear, which space is only separated from the brain by a very thin plate of bone.

Symptoms.—The symptoms are very vague. The patient is irritable, bad temperament, extravagant, dissipated, flighty, delirious and finally convulsions come on. There is headache and the temperature may be high or sub-normal.

Diagnosis.—The diagnosis is difficult, but after making a diagnosis, it is still harder to locate the seat of the abscess. By a thorough knowledge of the physiology of the brain, you can find out the location. Different parts of the brain preside over different parts of the body, and if in a suspected case, the hand is paralyzed or contracts, we know the abscess is somewhere near the center for the hand, or if the patient can't articulate, it is near the center for speech. In locating the abscess it is better to get a specialist to assist you, but do not let them operate; they know more about the brain than they do about the knife.

Treatment.—After making your diagnosis and locating the abscess, prompt and heroic measures should be adopted to save your patient's life, for if you wait the abscess will break, causing meningitis and the death of your patient. After shaving the scalp and rendering it aseptic, mark the bone over the site of the abscess with an awl or else after cutting up the scalp you will loose your bearings. Dissect up a horse shoe shaped flap, find the awl hole,

and with a trephine saw out a circular piece of bone, cut through the meninges and if you then don't find the pus aspirate, plunge the needle all about in the brain until you find pus, then bore down into the cavity of the abscess with a pair of artery forceps, irrigate and drain it thoroughly. The piece of bone is usually put back, but before doing so notch it and also the skin, so as to give exit to the drainage tube. The difference in trephining and trepaning is, in trephining you take out a circular piece of bone, which can be replaced after the operation. In trepaning, which is the old method, the bone was taken out with an instrument like an auger used to bore into wood, and the bone came out in shavings and could not be put back, and a piece of silver plating was put in its place.

LECTURE XV.

CLINICAL FORMS OF SUPPURATION.—Continued.

Before discussing suppuration in the large cavities of the body, it will be well to note the peculiarities characteristic of the process in these cavities. First, it is marked by the rapidity with which it is diffused over the lining membrane; second, it is characterized by the fact that there being no avenue of escape for the pus, it collects in large quantities.

Suppurative Arthritis.—This is a suppurative inflammation attacking the lining membrane of joints. A joint is composed of two articular surfaces of bone, held together by ligaments and lined by synovial membrane, which secretes a viscid fluid for the lubrication of the joint.

Cause.—It is caused by the pyogenic microbe, which may be introduced directly as by some external mechanical cause, as a stab or bruise; or indirectly by being conveyed by the blood to the joint, and there finding a weak spot it localizes, causing the trouble.

Symptoms.—The symptoms are simple. There is an acute, burn-

ing pain, due not so much to the severity of the inflammation or direct effect on the nerves, but to pressure from accumulation of pus. If it is the knee joint the limb will be flexed, mother nature flexes the limb and thus increases the space around the joint, and relieves the pain by giving room to the exudations; the limb is swollen, there is fever, which was preceded by a chill, nausea, vomiting, anorexia and the skin is flushed.

Diagnosis.—The diagnosis is based on the symptoms and history. The patient has recently stuck a nail in the joint or received a stab wound. If the germ was introduced indirectly you diagnose by the pain, flexed condition of the limb, fever and fluctuation. But to make your diagnosis certain you must confirm it with the aspirator.

Treatment.—The treatment must be prompt and effective; if it be delayed the pressure will become so great as to rupture the capsule spontaneously and thus the surrounding tissue becomes infiltrated. Operate early. Take the knee, for example; make the limb bloodless with Esmarch's bandage, render the part aseptic; make three incisions on each side of the joint as follows: One above the joint, one opposite it and one just below it. After incising the skin take a long pair of artery forceps and bore through the cavity until the forceps show on the opposite side, open the blades and clip the skin between them; now take a rubber tube, clip numerous holes in it, catch it in the forceps and in removing the forceps you place the drainage tube in position; put in the three tubes in this manner and irrigate through them daily with antiseptic solutions; dress the limb aseptically, using plenty of absorbing cotton. After the pus stops forming remove the drainage tubes one at a time, the top one first, then in two or three days the middle and about the fifth day the third one. To prevent stiffness of the joint, use massage and passive motion. If the above treatment fails from too long delay in operating, amputate the limb to save the patient's life.

Suppurative Meningitis.—This means suppurative inflammation involving the membranes of the brain or cord. The brain is located in the skull and is invested by three membranes, viz., from within, outward, Pia Mater, Arachnoid and Dura Mater. All three of

these membranes are liable to inflammation if from any cause the pyogenic microbe reaches them.

Cause.—The most common means by which the germ reaches them is through a compound fracture of the skull. But sometimes it is produced without any injury to the skull and we say the germ was conveyed by the blood and found a weak spot in the meninges where it could locate. The inflammation may be localized or diffuse; when localized it becomes so by nature throwing out lymph and building a wall preventing its further depredations; in other cases nature will be unsuccessful and the inflammation will be diffused over the entire surface of the membrane.

Symptoms.—Chills, fever, which may be as high as 105 to 107 degrees F., intense pain in the head, excitement and delirium, giving gradually away to coma and paralysis.

Diagnosis.—The diagnosis is based on the history of the case, the fact of previously having a compound fracture of the skull, opening up a gateway for the entrance of the germs or having previously had concussion of the brain, which weakened the tissues and opened up a "*Locus Minoris Resententiae*" pressure, headache, fever, etc., all help in the diagnosis.

Prognosis.—The prognosis varies; if the suppuration is localized it is good, but if, as in the majority of cases, the whole of the membrane is involved, the prognosis is exceedingly grave.

Treatment.—The principle treatment is the prophylactic. As nine-tenths of the cases follow compound fractures of the skull, the prophylactic treatment is the proper treatment of the fracture and the wound at the time it occurs. Treat the fracture as a major operation, anæsthesize the patient, shave the head, for it is impossible to render the scalp aseptic unless you do, neither can you operate with the hair constantly getting in your way; wash the scalp thoroughly with green soap and water, wash the soap off with alcohol, and lastly wash in a 1-1000 bi-chloride solution. Make your hands and instruments sterile and proceed in this manner: Make the wound larger if necessary, cut off all pieces of lacerated tissue, take out all splinters of bone, examine the dura and if it is bruised and bloody, incise it and remove the blood clots; if the brain is also injured and bloody, remove the blood and irrigate the wound with a 1-2000 bi-chloride solution, arrest all

hemorrhage and if the brain is not injured you can allow for drainage and suture the wound up, but if the brain is injured and the tissues bruised and lacerated and the bone splintered, pack the wound with iodoform gauze and treat it as an open wound. If suppurative meningitis does occur, the case is almost hopeless, but do your best to save life; take out a large piece of the skull (as large as two inches in diameter), irrigate the wound daily and give free drainage.

Suppurative Pleuritis.—This is a suppurative inflammation attacking the pleura. The lungs are invested by an envelope of serous membrane called the pleura, which consists of two layers, parietal and visceral, the layers are almost in contact and secretes a fluid which lubricates the surfaces and makes breathing easy. The suppuration may extend over the entire surface of the pleura, which constitutes a disease called Empyaemia.

Cause.—The essential cause is the pus germ, which may reach the pleura directly as a stab or cut or indirectly through the blood.

Symptoms.—The process is usually inaugurated by a chill, followed by fever, which may reach as high as 105 degrees F., and continue without intermissions. Anorexia, bounding pulse, slight cough, interference with respiration from the collection of pus in the sack, on palpation there is increased dullness, on auscultation the lung sound will be absent and there is sometimes slight bulging in the intercostal spaces.

Diagnosis.—The diagnosis is based on the symptoms, but must be confirmed by the use of the aspirator; the needle must be thrust obliquely between the sixth and seventh ribs and if your diagnosis is right, you will get pus on withdrawing the piston.

Treatment.—The operation is a common one, and must be considered a major operation. Anæsthesize the patient, and here it is admitted by the advocates of Ether, that Chloroform is the best anæsthetic. After making everything aseptic, make an incision along the seventh rib, reflect the periosteum and remove the rib; the space between the ribs is too small to explore the cavity satisfactorily, neither can you use a large drainage tube. Now make an incision directly into the pleural cavity and the pus will gush out. Don't allow the pus to escape too fast, as the patient may die from collapse; let out a pint, then stick your finger in the hole,

wait awhile and let out another pint, and so on until the cavity is empty. Introduce the finger and see if the lung expands and has not lost its elasticity, irrigate with a warm antiseptic solution (about 100 degrees F.); cold solutions will produce a fatal collapse. Insert two or three large drainage tubes and fasten them so they can't come out or drop into the cavity, irrigate the wound daily. Don't remove the tubes entirely at once, take them out about a half an inch every day, until entirely removed. In fastening the tubes, some surgeons stitch them to the skin, but this is painful. Take a large safety pin, stick it through the tube, fasten to the pin a piece of adhesive plaster, and stick this on the skin of the chest. As the tubes are removed, clip off a piece of the plaster and thus shorten it.

Suppurative Pericarditis.—This is a suppurative inflammation attacking the pericardium. The heart is invested by a fibrous coat, which is lined by a serous coat. The serous coat pours out a fluid which lubricates the surfaces and allows the heart to contract and dilate without friction.

Cause.—The cause is the pus germ, which is rarely introduced from without, but the disease is set up as a complication of some other infectious disease.

Symptoms.—The symptoms are not as plain as the surgeon would like them to be. There is usually a chill, followed by fever, rapid, bounding pulse, slight bulging over the heart, percussion over the pericardium gives increased dullness and there is difficulty in breathing.

Diagnosis.—When you are quite confident from the above symptoms that the disease exists, you are perfectly justifiable in aspirating. Introduce the needle in the fifth intercostal space one-half inch to the left of the sternum, carry the point backward, upward and outward about three-quarter inches, and the cavity is reached, which can be told by lack of resistance. There is on record by one operator of seventy-nine cases, in which the aspirator was used; one was instantly killed, five died in twenty-four hours and the remainder did well after the operation.

Treatment.—Make a small incision about one inch long in the fifth intercostal space, one inch to the left of the sternum, going through the skin and muscles, then bore down into the cavity with

a pair of artery forceps, irrigate daily through the drainage tube, which must be soft, and must not be introduced far enough to touch the heart and thus cause pain and discomfort.

Suppurative Peritonitis.—This is a suppurative inflammation attacking the peritoneum. All the organs of the abdomen, with a few exceptions, are covered by peritoneum, which is frequently the seat of disease.

Cause.—The cause is the pus germ. It may be introduced directly by a stab wound, by an incision by a dirty surgeon, and by the rupture of an abscess of the appendix, fallopian tube or liver. It is also said to be sometimes infected by the blood.

Classification.—Peritonitis is divided into acute and sub-acute. The acute is sometimes called septic peritonitis and the sub-acute suppurative peritonitis. Both processes are the same, the only difference is in their onset, post-mortem appearance and the pain. Septic peritonitis acts quickly, the pain is excruciating and the patient dies before pus can be formed. Suppurative peritonitis is a slow process, frequently circumscribed and amenable to surgical treatment.

Symptoms.—The first symptoms are those of intense shock, there is profound collapse, depression, fever with no remission up to 107 degrees F., pulse rapid, abdomen swollen, face anxious and pinched, tongue coated, clammy skin. These symptoms soon pass off and the skin becomes dry and red, tongue cracked, pulse bounding, abdomen tympanitic, pain excruciating and excessive vomiting. The symptoms then seem to get better, but is really a sign of the death of your patient.

Treatment.—Render everything clean around the patient; open the abdomen, flush out freely with saline solutions and give free drainage

LECTURE XVI.

CLINICAL FORMS OF SUPPURATION.—Continued.

Suppurative Osteomyelitis.—This is an acute suppurative inflammation, affecting the medullary cavity in bone tissue. It is of frequent occurrence, disastrous in its results, often endangering the life and limb of the patient when not diagnosed before the later stages. It is usually seen in long bones, especially the femur, and at a point denoting the junction of the epiphysis and diathesis. It is occasionally seen in the ribs, clavicle and ilium.

Causes.—The indirect causes are age, sex, cold, traumatism and acute diseases. The direct cause is the pyogenic microbe. This fact was not admitted up to fifteen years ago; it was thought to be due to a specific microbe. But experiments have proven that it is due to the pus germ, as germs from osteomyelitis have been cultured, and when introduced beneath the skin, they cause abscesses identical with those formed by the pyogenic microbe and inoculations from these abscesses will cause in an animal having a diseased bone a disease parallel with osteomyelitis. The germ is not generally introduced through a wound, it floats in the blood and locates in a weak spot in the bone, which has been deviltilized by Typhoid fever, measles, etc., and the point is generally at the junction of the epiphysis and diathesis, as this point has less vitality from the tissues being more embryonic, less mature and therefore more liable to bacterial infection. Again the blood vessels at this point have very poor walls, in fact, they are nothing but a series of channels without distinct walls, and they are four or five times larger than the capillaries which convey away the blood.

Pathology.—In suppurative osteomyelitis we first have the germ entering the circulation through the skin, tonsils or intestines, it floats in the blood and finding some place in the medullary cavity of a long bone in which it can localize it does so, causing the disease. The capillaries are first attacked, causing hyperaemia, exudation and transudation from the vessels, which is rapidly converted into pus. The pus is thus enclosed in a bony wall, but finally by pres-

sure it spreads through the Haversion canals, reaching the periphery of the bone, it then attacks the periosteum, which finally gives away, and it infiltrates the paraperiosteal tissue. Then we have a phlegmonous suppuration of the soft tissues, which extends toward the surface of the limb, causing necrosis of the part by pressure and occluding the blood vessels. Eventually a fistula is formed through which the pus escapes. In the abscess cavity of the bone there is found a piece of bone, which has been killed by the disease and has separated from the healthy bone, and lies in the cavity as a foreign body, this is called the Sequestrium. The Involucrum is the bony wall which holds the sequestrium and the cloicae is the opening in the Involucrum to permit the passage of the pus through the fistulous tract.

Symptoms.—The premonitory symptoms are indisposition, lassitude and general weakness. These are soon followed by a chill, fever ranging from 103 to 104 degrees F., with no remission, pulse rapid and feeble, breathing shallow and difficult, tongue coated and cracked, diarrhœa and delirium. The local symptoms are the same as in any case of suppuration where the products are confined. The pain which is exquisite is not localized, but usually referred to some neighboring joint. It is described as an intense, boring, tearing, breaking pain and is not relieved by opium. The pain suddenly disappears, which denotes the time at which the pus escapes from the bone into the surrounding tissue. We have tenderness exquisitively marked, especially over the part where the suppuration commenced. The area of tenderness will mark the progress of the disease. Swelling takes place only after the pus escapes into the paraperiosteal tissue. Redness and heat are due to the acute inflammation, and also doesn't occur until after the escape of the pus from the bone. The process is now very rapid, soon involving the whole circumference of the limb. The function of the part is necessarily lost, the patient resting the limb, as the least jar causes intense pain.

Diagnosis.—As the surgeon is not usually called until during the later stages of the trouble, a sinus can be seen leading through the soft parts down into the bone. The sinus will be surrounded by granulations or proud flesh. A probe passed into the medullary cavity will usually detect the sequestrium. Rarely has the surgeon

the earlier stages to treat, but the complications resulting after the pus has escaped from the bone. An early diagnosis is important that the successive stages may be aborted. Ninety-nine per cent. of post-mortems for dead bone show osteomyelitis to be the cause. Differential diagnosis is sometimes impossible and requires a careful study of the various diseases. Inflammatory rheumatism may be taken for it, though osteomyelitis has no swelling until the later stages. It may be mistaken for joint inflammation, suppurative periostitis, phlegmonous inflammation or even typhoid fever.

Prognosis.—The prognosis depends upon the intensity of the disease. It is sometimes fatal in two or three days; so virulent is the germ that death ensues before suppuration begins. This hasty termination is rare, and if surgical aid is employed early enough and the proper measures taken, life is usually saved, but the usefulness of the limb is scarcely ever restored.

Treatment.—The palliative treatment consists in the administration of purgatives, put the patient to bed and elevate the limb, pack the part in ice, thus keeping down excessive hyperaemia and give opium for the pain. There are three stages in which an operation might be performed. 1. Before the bone is perforated; 2. After the bone has been perforated, but before the dead bone has separated and an involucrum formed; 3. After the separation of the dead bone and the formation of the involucrum. The operation in the first stage consists of rendering the part aseptic, cut through the soft tissues down to the bone, reflect the periosteum and chisel a small hole in the bone and allow the pus to escape, then curette out all the dead bone, irrigate with bi-chloride of mercury and dress aseptically. In the second stage cut down into the phlegmonous inflammation, irrigate and disinfect these tissues, find the cloicae, slightly enlarge it, but don't chisel into the bone and try and take out the sequestrium, for it hasn't become separated as yet, and you are liable either to take out too much or else not remove all the diseased bone. The operation in the third stage is the most common and is called Sequestrotomy. Render the limb bloodless with Esmarch's bandage, find the cloicae, take off the roof of the cavity with a chisel, remove the sequestrium, thus leaving a trough in the bone, curette out all the dead bone, disinfect the cavity with Peroxide of hydrogen or a bi-chloride solution, close

the wound and wait for healing. If the cavity be large, allow the capillaries to bleed into the trough, and when a clot forms it will form a bridge for the new bone tissue. Dr. Senn packs the cavity with decalsified bone chips, which greatly facilitate restoration of the part.

LECTURE XVII.

ULCERATION—FISTULA—SINUS.

Ulceration.—An ulcer may be defined as a solution of the continuity of the skin or mucous membrane, which shows no intrinsic tendency to heal. An accurate knowledge of an ulcer and its treatment is necessary to every practitioner. They are difficult to treat, being most common amongst the poor, who are ill-fed and unable to lay up or pay for the proper remedies and treatment.

Divisions.—Ulcers are divided into superficial, deep, acute and chronic. Superficial ulcers, as their name indicates, only attack the superficial structures; deep ulcers also involve the deeper structures. Acute ulcers come on quickly, run a definite course and subside; a chronic ulcer comes on slowly, shows little inflammation and are hard to heal.

Causes.—The constitutional causes are certain infectious diseases as syphilis, tuberculosis, leprosy, etc. They also follow disturbances to the nutrition of the tissues, as in cachexia, anemia, scorbutis and diabetes. The local causes may be a blow or bruise, application of strong caustics, intense heat or cold, certain disturbances in the circulation, as by cutting off the arterial supply by a ligature or pressure or by defective venous return, causing stagnation; defective trophic influence, as seen in the perforating ulcer of the foot, where no other cause can be given.

Anatomical Character.—An ulcer is said to have a floor, margin and an underlying or surrounding tissue. The floor or base is the depressed central part of the sore; it is below the skin level,

flat and covered with granulation tissue, which varies in color with the type of the ulcer. The margin or border is that part extending from the floor to the skin; it may be vertical, excavated or sloping. The adjacent tissue is hard, dense and even cartilagenous in texture, from the spreading of the inflammation.

Diagnosis.—The diagnosis is based on the character of the wound and its cause.

Prognosis.—The prognosis depends on the type of the ulcer, cause producing it, general health of the patient, pecuniary condition and the ability of the attending surgeon.

Varieties.—There are many varieties described, based on the cause and clinical behavior.

1. Inflamed or Traumatic Ulcer.—This form is always produced by an injury, as a burn, bruise, etc., which becomes infected. It is not a deep-seated ulcer, and is covered with pale granulation tissue and there is a tendency to heal.

Treatment.—This form yields to rest and disinfection; apply moist antiseptic dressings, which must not be removed too frequently and the wound soon heals.

2. Indolent, Weak or Callous Ulcers.—This is an ulcer of long standing, which perhaps was originally a traumatic ulcer, but from improper treatment degenerated into this type. They are not deep, and the margins are hard, thick and granulated.

Treatment.—Make the wound and the surrounding tissue clean and stimulate the cells with nitrate of silver, ten per cent. solution of chloride of zinc or a solution of copper sulphate; if these fail, touch the surfaces with a red hot iron or dissect out the dead tissue and dress aseptically.

3. Exuberant or Fungous Ulcers.—This type is just the reverse of the preceding. It makes too great an effort toward healing, and the granular tissue rises above the level of the surrounding tissue; this is the so-called "*proud flesh.*" Epidermization is impossible, but in the effort to cover it, it constricts the "*proud flesh*" and gives it a pediculated appearance.

Treatment.—Disinfect and shave off the superfluous tissue down even with the skin, slightly cauterize the surface with nitrate of silver, so as to obliterate the arteries and thus prevent its further growth. Dress with moist antiseptic dressings.

4. Irritable or Erithistic Ulcers. --This type of ulcers are so sensitive that it is impossible to wash them, and unless the part be given absolute treatment you can't cure them. Their most frequent site is the rectum or around the margin of the navel. They are deeply excavated, discharges a serous pus and very irritable.

Treatment.--Remove the cause. If it is the rectum paralyze the sphincter muscle, paint with cocaine and either dissect it out or apply some escharotic, such as carbolic acid or nitrate of silver.

5. Phagedenic or Gangrenous Ulcers.—This ulcer is due to a microbe of great virulence, which causes rapid cell necrosis. The ulcer spreads very rapidly, one side healing, while the other is involving the neighboring tissues. Their most frequent site is on the penis.

Treatment.— The treatment consists of perfect fumigation with sulphuric acid or actual cautery. Whenever an ulcer won't heal, always substitute the old wound by a burn and it will then heal.

6. Varicose Ulcers.—This is the most frequent type. It is caused by defective venous return and is usually seen on the lower extremities. The valves in the veins give way, and through pressure in the veins serum escapes into the surrounding tissue, causing the ulcer.

Treatment.—Remove the cause and thus stop the transudation of serum into the tissues. Put the patient in bed, elevate the limb, and so by gravity assist the venous flow. If the patient is poor and can't lay up, strap the leg with flannel or rubber bandages from the toe to the popliteal space. You can never hope to cure the ulcer until the fluid is driven out and kept out of the limb.

7. Trophic Ulcers.—These are due to defective nervous supply and are difficult to treat, as you can't remove the cause.

Treatment.—The treatment consists of rest and cleanliness and the use of antiseptic dressings.

8. Specific Ulcers.—This type is due to specific diseases, as syphilis, anthrax, tuberculosis and glanders.

Treatment.—The treatment must be on general principles, if syphilis, give mercury; if tuberculosis, build up the general health, etc. Dress the ulcer with moist antiseptic dressings.

General Treatment of Ulcers.—Give the part absolute rest and elevate it to promote venous return (a dependant position aggra-

vates the condition). Remove the cause producing the ulcer; if due to syphilis, give Iodide of potash; if due to tuberculosis, give cod liver oil; treat the cause that the result may be removed; if it is due to defective circulation elevate or use warm applications. Obtain and maintain asepticity; all ulcers are caused by a microbe, and therefore you must employ germicides, in solution or otherwise, as a dressing; never use salves or vasaline. If these methods fail either stimulate with nitrate of silver or help mother nature by skin grafting.

FISTULA.—A fistula is an abnormal opening from the skin or mucus membrane into a normal cavity; as an opening leading from the skin into the pleural cavity, or the opening made in the bladder by a surgeon. Fistulas are named acording to the anatomical structure involved, as Vesico-vaginal, Recto-vaginal, Gastric, Fistula in ano etc. They are caused by some defective foetal development or by pressure causing sloughing.

TREATMENT.—Freshen the edges, bring them together and suture, using proper antiseptic precautions.

SINUS.—A sinus is an abnormal opening from the skin or mucous membrane into an abnormal cavity, as from the skin down into the involucrum of the bone, or from the skin or mucous membrane into a tubercular abscess.

TREATMENT.—A sinus can only be cured by splitting open the cavity it leads from, and by thorough irrigation you remove the cause and the sinus will heal.

LECTURE XVIII.

GANGRENE.

GANGRENE, MORTIFICATION, NECROSIS AND SPHACELUS, are synomymous terms used to designate the death of the tissues "*en masse.*" These terms, as used by certain English writers of former days, bore a different significance from that of to-day. With them gangrene,

mortification and sphacelus meant death of the soft tissues, while necrosis was restricted in its meaning to death of bone. A more modern and scientific distinction has been drawn between these terms; recent literature speaks of gangrene, mortification and sphacelus as death of a part exposed to the atmosphere, a superficial region, where putrefactive bacteria gain ready access; while it describes necrosis as death of an internal organ or an area which is unattended by putrefactive changes.

Causes.—The general causes are debility and certain constitutional diseases, as starvation, old age, long sickness, excessive loss of blood, Bright's disease, diabetes and anything which will vitiate the tissues. The local causes are: 1. Interference with the arterial supply. It is essential to the life and vitality of tissues that they should have an adequate amount of blood reaching them, and anything which interferes with the blood supply will therefore cause death of the tissues. These conditions are trauma, as a stab wound penetrating some large artery; pressure, as from a tight plaster cast; ligation; spasms of arteries, thrombosis and embolism. 2. Interference with venous return. This is as important as the foregoing cause of gangrene, as for the tissues to be in a healthy condition, not only must the arterial supply be normal, but the venous blood must be carried off to be freshly oxydized; thus anything which stays this venous return will cause the trouble. It may be due to a traumatic blow, as a stab, which occludes some large vein; pressure of tight bandages, ligature, thrombus or embolus. 3. Defective nervous supply. For a tissue to thrive, not only must it have proper arterial supply and be drained of its venous blood, but must have its trophic nerves in a proper condition, and anything interfering with their normal function is liable to cause gangrene, as by destroying the vaso-motor nerve to a part, anemia and gangrene follow. 4. Direct action of destructive agents on tissue. As a car wheel passing over a limb, crushing it, pressure, as bad sores, inflammation may cause it, exposure to excessive cold, or intense heat, and the direct action of caustics.

Varieties.—There are two varieties of gangrene—Dry and Moist. Dry gangrene is due to interference with the arterial supply to the part, as the result of obliteration or plugging of an artery, without any abnormality of the venous return. The part

becomes dry, hard and atrophied almost as soon as the arterial blood is cut off and what little blood was in the part is soon drained off by the veins. The skin soon becomes leathery; the constitutional symptoms are few, because of non-infection and the absence of decomposition. The separation between the dead and living tissue takes place slowly and with little danger to the life of the patient.

Moist gangrene is produced by some interference to the venous return, the arterial supply being normal. This causes the tissues to become swollen, water logged and surcharged with venous blood. The part soon becomes infected and putrefies; the absorption of the decomposition products, causes general constitutional symptoms to supervene. Often we have a rapid and fatal termination due to acute septicaemia.

Symptoms.—The general symptoms are due to the absorption into the system, the products of decomposition. The symptoms of septicaemia follow: Chills, fever, apathy, drowsiness, face ashy, then becoming yellowish, pulse rapid and small, respirations shallow, clammy perspiration and finally death. The local symptoms are important, being more distinct than the general. There is pain which from the first stages, changes in intensity. In the earlier stages it is intense, whether the trouble is due to a tight bandage, an embolus or to acute inflammation. It subsides gradually, and when quite lost it shows that the trouble has resulted in perfect death to the part and the nerves within it. There is tenderness (pain elicited on pressure), this is of value in the diagnosis, it is acute in the earlier stages, gradually subsiding until the part has become devitilized, when it is absent altogether. The temperature varies. If the gangrene be due to plugging of the artery to the part, the temperature of the anemic part at once falls to sub-normal. If due to acute inflammation, it is first high, but as soon as the parts become devitilized, the temperature falls below normal. The pulse in the artery to the part is absent when gangrene is complete, and is one guide to a correct diagnosis. Swelling is present in the moist variety, due to the surcharged, water-logged condition of the tissues, but in dry gangrene it is absent, the part becomes shriveled and atrophied from lack of moisture. Emphysema is present in moist, but absent in dry gangrene. When

present, it can be elicited by manipulation, as a dry, crackling, resonant sound. The color depends on the variety, if due to defective arterial supply, the part is pale and anemic; after the tissues die, by virtue of a chemical change, it becomes livid, blue, black, blistering and showing all the usual putrefactive changes. The odor in the dry variety is *nil*, but in the moist variety a most horrible, unbearable stench is constantly exhumed. The line of demarcation is not a symptom, but is a phenomena often observed. It is a line drawn by nature between the dead and living tissue.

Diagnosis.—The diagnosis is usually plain, both by the nose and sight. The dead tissues have an appearance and smell not easily mistaken. Sometimes, as in strangulated hernia, it is difficult to differentiate between gangrene and congestion of the part.

Prognosis.—The prognosis depends on the type, age, general health and surroundings of the patient.

Treatment.—The prophylactic treatment consists of medicinal and dietetic measures. Use every means possible to favor the blood supply and remove every condition favorable to the development of gangrene. If the cause of the threatened gangrene can be removed do not hesitate, but act. If it be a strangulated hernia, divide the constricting ring; if a tight plaster cast, remove it; if inflammation threatens to terminate in gangrene, relieve the tension by a free incision. Try and favor the establishment of the collateral circulation; lower the part to favor the arterial supply, elevate it to favor venous return, preserve the warmth of the limb with hot applications and pay special attention to asepsis and antisepsis to prevent the invasion of putrefactive bacteria. The curative treatment consists of sustaining the strength with nourishing food and stimulants, as quinine and strychnia. If the patient is young and robust, it is best to wait for the line of demarcation; but if old and feeble and the disease shows no signs of becoming limited, an early operation for the removal of the dead tissue must be resorted to, thus minimizing the danger of general septicaemia from absorption of ptomaines and toxins.

LECTURE XIX.

CLINICAL FORMS OF GANGRENE.

Progressive Gangrene.—This is a moist gangrene which follows injuries to the soft tissues and is characterized by rapid extension and fatal termination.

Cause.—This variety follows large wounds, as after extirpation of a breast. It is still a mooted question whether it is caused by a specific germ. The streptococcus pyogenes is generally found associated with the disease and its virulent action is accounted for by the lowered vitality of the tissues.

Symptoms.—The symptoms usually appear in a few hours. The local symptoms are evinced at the point of infection. The wound is swollen, red, angry looking, the surrounding tissues have a crimson tint and there is a sanious discharge from the wound. The tissues then become blue, then black and, in fact, you have all the signs of mortification before you. The tissues crepitate under your fingers, caused from the bursting of air bubbles, the skin is thrown up in blisters, the patient is unconscious, the discharge is putrid and nine out of ten such cases die. The constitutional symptoms caused by the absorption of the toxins are high fever, preceded by a chill, hurried respirations, quick, feeble pulse, the patient is irritable and anxious, then comes on stupor, delirium and lastly profound coma.

Treatment. The most important treatment is the preventive, which consist in cleanliness. If a limb is broken and the wound is dirty, don't let others clean it, do it yourself, remove all splinters of bone, clip off all small pieces of lacerated tissue and dress aseptically. After the disease has commenced don't wait for anything, operate at once. Formerly the line of demarcation was waited for with the result that every case proved fatal before the line was formed. In operating never use Esmarch's bandage, as it may force diseased tissue and pus into healthy tissue, causing further complications. Slightly elevate the part and apply a tourniquet. Amputate, if it be a limb, as far from the diseased tissue

as possible, only thinking of the patient's life and not his limb; of course, you must use judgment and remember the nearer you go to the trunk the greater will be the shock and general danger. If the operation is successful the symptoms will subside in four or five days. If sepsis increases, remove the dressings, and as a last hope resort to continual antiseptic irrigation and stimulation.

Senile Gangrene.—This is a specie of gangrene which attacks old people, and is due to some degenerative changes in the arteries, causing obstruction to the blood supply. When I say it occurs in old people, I mean people with diseased arteries, no matter if they are thirty or seventy. "*A man is as old as his arteries.*"

Cause.—It is usually caused by some form of Endarteritis, which may be from excessive drinking. The disease is more frequently located on the great toe.

Symptoms. —*Premonitory.*—A man will come to you between the ages of forty and seventy, who has either led a fast life or has inherited artheromatous degeneration and will complain of a tingling sensation in his big toe. When he walks it feels like there is a foreign body between his foot and the ground, the foot may be red and swollen and you may diagnose an ingrowing nail.

Developed. --Soon the tissues become a dusky red, gradually turning blue, then black; there is no swelling or odor, the toe becomes dry and wrinkled, there is no line of demarcation between the diseased and healthy tissue and if nature doesn't stop the process it will extend up on the foot and leg. The constitutional symptons are not well marked.

Prognosis.—The prognosis is generally good, as the line of demarcation usually forms and gives a guide to the surgeon.

Treatment.—The prophylactic consist in treating the premonitory symptoms. Elevate the limb, keep the part warm and clean, scrub the toe with a bi-chlroride solution to prevent infection, prohibit tight shoes and wrap the part in cotton. If gangrene does develop, and is progressing slowly, wait for nature to form the line of demarcation; but if it progresses rapidly and shows no signs of abating, operate at once. The amputation should be performed just below or above the knee.

Diabetic Gangrene.—This specie of gangrene occurs in combination with a disease known as Diabetes, or sugar in the urine.

The pathology of the disease is not understood, but is probably due to brain, liver or kidney trouble. Besides sugar in the urine, there are eruptions on the skin, as furuncles, carbuncles and sometimes local gangrene. This localized gangrene may occur on any part of the body, but usually occurs on the leg.

Symptoms.—The symptoms are redness and congestion of the affected part, turning yellow, purple, then black. The line of demarcation usually forms, but occasionally the trouble spreads and death results from septicaemia.

Treatment.—The prophylactic treatment consist of treating the cause. Put the patient on a rigid diet containing no sugars or starches. Feed on steaks and green vegetables and use saccharine as a sweetening agent. The fact that diabetic people are always liable to gangrene, should make you careful in consenting to operate on them, unless the patient is suffering from diseases like hernia and appendicitis, when you should not hesitate. After the gangrene is apparent, watch the disease and if the line of demarcation forms, clip off the diseased tissue, disinfect and dress with antiseptic dressings. But should the disease progress, heroic surgery will be the last resort.

Decubitus Gangrene.—This specie of gangrene is due to pressure, as a bed sore or from improperly applied splints.

Symptoms.—There is a tingling sensation about the part, with a dusty redness, turning yellow, blue and black. If the part is not relieved of the pressure it sloughs, emitting foul gases, and bloody, acrid discharges.

Treatment.—The most important is the prophylactic. In applying a splint, see that it is well padded. When your patient is confined to the bed for a long time see that no one area of the body is kept from a proper supply of blood longer than three hours, keep the back clean and bathe it with alcohol once or twice a week to harden the tissues. When a sore is threatened, remove the cause, which is pressure. If the patient is financially able, get a water bed; if not, use a common rubber bag or towels. When the process does occur you must treat it heroically or the loss of tissue will be frightful. Render the part clean, apply moist antiseptic dressings, and as soon as the necrotic tissue comes away dust the wound with iodoform and apply an antiseptic dressing.

Noma or Cancrum Oris. —This is an exceedingly rare disease; it attacks the cheeks, usually of children between the ages of three and four. It occurs in epidemics amongst the poverty-stricken children, who have poor food, badly clad and consequently suffer from lowered vitality. It is seen following eruptive fevers.

Symptoms.—There appears on the mucous membrane of the mouth a livid spot, which turns first red, green and lastly black. This extends through the cheek and opens on the skin, blebs and blisters form, emitting foul gases and discharges. The process may extend to the gums, causing loss of teeth, and even to and causing necrosis of the maxilla.

Treatment.—Strict hygeine and proper food and clothing will render the disease improbable. The curative treatment consists of thoroughly removing the diseased tissue, cauterize the surface, and if recovery follows do a plastic operation. Sustain the strength with stimulants and nutritious food.

Hospital Gangrene.—This is a contagious variety of wound infection, which occurs in crowded wards. The microscopist and bacteriologist would be pleased to see a case of this disease, but since the days of asepsis and antisepsis the disease has not been known. We do not know whether it is due to a specific microbe or not. It attacks wounds four or five days after they are made, causing acute progressive gangrene, which usually ends fatally.

Symptoms. —The constitutional symptoms are not well marked.

Locally the wound looks angry, red and inflamed; next it becomes yellowish in color, the tissues are soft and a foul smelling discharge is emitted. It gradually spreads, literally eating away the tissues.

Prognosis.—Regardless of treatment fifty per cent. die.

Treatment.—Prevent the disease by modern aseptic methods.

When the disease occurs, substain the strength with stimulants and good food, render the part aseptic and take out the tissue until you reach healthy tissue, cauterize it and dress antiseptically.

LECTURE XX.

SHOCK.

Shock may be defined as profound depression of all the vital powers. It has long been known that patients who met with accidents or underwent operations, not of themselves necessarily fatal, often died without an explanation. In clearing up this phenomena, the English surgeons for once got ahead of the scientific German students.

Typical Case.—Suppose a man fell from a house and fractured his leg. When gently put on a litter he makes no attempt at movement or speech, his face is pale and pinched, his eyes are sunken, he has a vacant stare, no expression, pulse rapid and thread-like, respiration shallow and sighing, skin covered with a cold, clammy sweat, temperature sub-normal, he replies to questions with indifference, there is no coma, but apathy, spinchters relaxed and feces pass involuntarily, he lays perfectly still, not because his muscles are paralyzed, but simply do not act. This is a clinical picture of shock, and unless prompt measures are taken often proves fatal.

Causes.—The causes of shock are numerous, and in fact, may be produced by almost anything. Pain long continued will bring about the condition, it being common before the advent of anæsthetics. Extensive burns, where the cutaneous extremity of the nerves are destroyed: extensive injuries, though the pain be insignificant, as in a dislocated bone, crushing wounds in railroad accidents, etc.: excessive hemorrhage, as where a tourniquet slips in an amputation; operations on the genital organs, blows on the head, jugular vein, testacles and stomach and mental emotion will also bring on shock. People at both extremes of life are more liable to shock. Women are less liable to shock than men; invalids less than robust men; a person with a quick, nervous temperament is more liable than a slow, stupid, phlegmatic person whose senses are not keen or perceptive. A patient who goes on the operating table with gloomy dreads, suffers more from it than one who goes

in confidence and hope; so always send your patient on the table with an assurance of a speedy recovery, and with faith and confidence in your ability. Always tell a patient what he has got to go through, then let him decide for himself. If he decides to be operated on, no matter how seriously you think of the operation, it is your duty to cheer him up with your successes in the operation, and send him to the operating table in a condition to prevent shock. Mental emotion, as mentioned above as a cause of shock, may seem strange, but often causes it, as the hearing of the death of a near relative or having lost a fortune. In a college in Europe the students, having a grudge against the janitor, decided to hold a mock trial, condemn him and go through an execution. The janitor was carried to the forest and condemned to die, he took it as a joke at first, but finally got scared and begged for mercy, but the students wanted revenge. He was blindfolded, his head laid on a block and the executioner told to chop it off. He was struck back of the neck with a wet towel, and much to the students surprise, rolled over dead from no injury, but from shock brought on by mental emotion.

Pathology.—The pathology of shock is not understood. There are about fifteen theories to explain it, but only two will claim our attention. These come nearer explaining it than any yet advanced, and they probably act together.

1. Vascular Theory.—The exponents of this theory claim that all the symptoms of shock are due to the variation in the calibre of the blood vessels, which is regulated by the vaso-motor nerves. That the stimuli of an injury inhibits the action of these nerves and the vessels become widely dilated. Since the abdomen contains such an abundant vascular supply, the dilation in that region causes an accumulation of blood there (the vessels, when in a dilated condition, being able to hold all the blood in the body), and the brain does not receive a sufficient supply of blood for it to perform its functions and shock results. The symptoms are those of hemorrhage and in fact, it is intra-vascular hemorrhage into the abdominal vessels. This theory also explains the mental condition, pale face and cold skin.

2. Nervous Theory.—The advocates of this theory reason from a physiological standpoint. The physiologist tell us that when-

ever a nerve is stimulated it performs some function, and on repeated stimulation the nerve becomes fatigued and fails to respond to the stimuli. Now they claim that if the repetition of a slight stimulus will so fatigue a nerve as to inhibit its action, one great stimuli will produce the same effect, as when the auditory nerve is stimulated by a loud sound you are unable to hear until the nerve has rested. So it is in shock. The stimulus produced by the injury so fatigues the higher nerve centres that they are incapable of performing their functions, and the person is in a state of collapse or shock until the centres are revived by rest.

Symptoms.—The face is so changed as to be unrecognizable, it has a pale, cadaveric, sickly, white appearance, eyes sunken, eyelids drooped, nose puckered, the skin of the body is white, cold, shrivelled and bathed in a clammy sweat. The mind is not seriously affected, there is no delirium or unconsciousness, but he acts slowly and doesn't comprehend his position. The muscles are not paralyzed, the patient being able but not inclined to move. The respirations are feeble and shallow, only the upper portion of the lungs being used. The pulse is rapid and feeble and gives a flickering sensation to your fingers. The temperature is sub-normal, which gives a differential diagnosis from a chill, as in a chill the other symptoms are present, but the temperature is above normal.

Termination.—If reaction occurs the symptoms gradually disappear. Color comes in the lips and cheeks, the finger nails lose their leaden color, warmth returns, the patient turns in the bed and vomits, pulse gets stronger and more regular, respiration fuller and the temperature becomes normal. When the patient shows none of the signs of reaction, and the symptoms supervene as pictured in the first of this lecture, no treatment seems to do any good, the patient gradually sinks and dies.

Diagnosis.—The diagnosis is based on the symptoms and the history. It may be confounded with hemorrhage, but the treatment of both are the same.

Prognosis.—The prognosis is uncertain. Patients apparently at death's door may recover, whilst those about whom no anxiety has been felt suddenly gets worse and dies.

Treatment.—The prophylactic treatment is important. Always before commencing a serious operation put your patient in as good

condition as possible, encourage him and implant in his mind that he will recover, but be sure and warn the parents and friends. Give drugs to prevent shock, the best of which is quinine; if you are going to operate at one o'clock give him five grains at six o'clock in the morning, five grains at nine o'clock and ten grains at twelve o'clock. If the heart is weak, administer one-tenth to one-fifteenth of a grain of strychnia nitrate an hour before the operation, alcohol is also good, but never give it just before the operation, unless by the rectum, as it will cause vomiting if given by the stomach. It was the old custom to give $\frac{1}{4}$ grain of morphia to 1-100 grain of atropine, but quinine is now preferable. Avoid loss of blood, time and heat. The modern surgeons with their anæsthetics, go about their work too slow, the time is not lost so much from slowness of operating, but because the proper preparations have not been made, so see that you have everything necessary to complete the operation before starting. Avoid loss of blood by doing quick work, by being careful about the tourniquet and by using plenty of artery forceps. Avoid loss of heat, don't douche the patient with cold solutions and keep off draughts.

If shock does occur, get the patient to bed, don't do anything while he is on the table. Keep him absolutely quiet, exclude relations from the room and give absolute physiological rest. Get the patient warm, wrap a hot blanket next to his skin, put hot bottles, flat irons or bricks to his feet, stimulate him with morphia 1-6 to atropia 1-100, give one-tenth grains of strychnia and repeat in a half an hour, give whiskey by the mouth unless the patient is nauseated, then give it per rectum. Hot coffee injected into the rectum is an efficient remedy, it gives heat as well as being a stimulant. Lower the head and thus let blood flow by gravity to the anemic brain. Practice anto-transfusion, this is accomplished by bandaging the legs and arms and thus force blood to the brain. If this fails practice transfusion. In former days blood was used from other animals and forced into a vein, this has given away to the normal saline solution (one teaspoonful of salt to a pint of water); boil this, and when it falls to the temperature of the body, inject directly into a vein or into the subcutaneous tissue. The effect is sometimes wonderful.

The question of operating during shock is a difficult one to answer. If called to a man who has been crushed in a railroad acci-

dent it is best not to add the shock of an operation to the shock caused by the injury, for you are almost sure to kill the patient, but sometimes the shock is intensified and prolonged by the pain, shock succeeds shock and you had better operate.

LECTURE XXI.

SEPTICEMIA.

Septicemia or Sepsis is a fever produced by the absorption into the system of the products of fermentation or of putrefaction. The term is a general one and includes the three following conditions:

1. Aseptic or Fermentation Fever.—This form is due to the absorption into the system of the products of aseptic tissue necrosis.

Cause.—It has long been known that liquids which were non-poisonous when injected into the system would cause fever; normal saline solutions and trypsin will do it. These liquids, when injected into the system, are supposed to cause the fever by breaking up the white blood corpuscles and liberating the fibrin ferment which produces fever. So in this form of fever it may be caused by using strong antiseptic solutions, which produce necrosis or disintegration of the tissue, which are absorbed or by closing a wound before the capillary bleeding stops, thereby forming a clot which disintegrates and is absorbed.

Symptoms.—The symptoms are plain. After performing an operation and using strong antiseptics, in about twenty-four hours you will find your patient with a temperature of 100 to 103 degrees F., pulse quick, but there is nothing to indicate sickness, there is no anorexia or prostration, the patient says he feels well and may not stop walking around his room. The fever lasts from one to four days and suddenly subsides.

Prognosis. —Good.

Treatment.—The curative treatment is "*nil*," for the patient will be well in forty-eight hours, but by proper technique you can

prevent the fever and thus save yourself and patient the anxiety. Never have your antiseptics too strong; obtain thorough haemostasis before closing the wound and you will not be bothered with aseptic fever.

2. Sapremia or Septic Intoxication.—Sapremia is due to the absorption into the system of the products of putrefaction; not of the germs, but of their products, "*Toxins and Ptomaines.*"

Cause.—The cause is the presence in the wound of dead tissue, which has become infected by micro-organisms causing it to putrefy, with the formation of toxins and ptomaines, which are absorbed into the system The poison is, therefore, formed in the wound, and does not come from without.

Symptoms.—In about forty-eight hours after the operation there is a chill. Up to this time the wound does well, regardless of the piece of dead tissue it contains, this is because it takes the germs about this long to get in their work. The chill is severe, the teeth chatter and the bed shakes; fever follows, which may reach 104 to 105 degrees F. The symptoms come on suddenly, due to the sudden introduction of poison into the system, and they reach their maximum intensity from the first, just as when any other alkaloid, as strychine or morphia, is introduced into the system. The fever is continuous; pulse rapid, strong and bounding, unless the dose of the poison is large, when it is rapid and feeble; the digestive system is horribly upset, anorexia, vomiting and diarrhœa supervenes and the patient refuses all food; the urine is concentrated, of a high color and loaded with urates; on standing it has a muddy appearance. The nervous symptoms commence with the chill; there is depression, terror, irritability; he is restless and inquires anxiously about himself; in a short while he becomes comatose, the pulse grows weaker and weaker and gradually ceases. Locally the wound will be found to contain a piece of dead putrefying tissue.

Diagnosis.—The diagnosis is based on the symptoms and the fact of finding dead putrefying tissue in the wound, which the nose readily detects on examination.

Prognosis.—This depends on the amount of the poison absorbed and the resisting power of your patient. If the dose is sufficient to kill you can do no good, but if the first dose is small it depends

on your ability as a surgeon and the situation of the wound which, if accessible to operative interferences, makes the prognosis good.

Treatment.—The prophylactic treatment consist of measures, which prevent the decomposition of dead tissue when it is left in a wound through necessity, which if possible, should be avoided, but in doing a Hysterectomy you are compelled to leave a dead stump, and the strictest aseptic precautions must be taken to keep it from putrefying. Dry the surface, dust with iodoform and dress with plenty of antiseptic gauze. After the disease has developed, the curative treatment consist of opening the wound, removing all dead tissue and thoroughly disenfecting the wounded surfaces. Administer tonics, of which quinine is the best (three grains, three a day); if the pulse is weak give one-tenth grain strychnia, or fifteen drops of digitalis, injected under the skin, but the latter is liable to produce an abscess, give whiskey or champagne with a free hand, even until the face flushes and it can be detected on the breath.

3. Progressive Septicemia or Septic Infection.—Progressive septicemia is due to the introduction into the system of living pathogenic micro-organisms. The poison is produced outside the body and conveyed to it and thus makes the disease not very amenable to surgery.

Cause.—The cause is the presence in the blood and tissues of germs, which multiply and produce their specific poison. How these germs get into the body and how they act is not known. The disease occurs from small as well as from large wounds. The exact nature of the germ is not known, but the streptococcus is usually found combined with other germs.

Symptoms.—If the pathology of sapraemia is remembered you will know the symptoms of septic infection, as the only difference is, in sapremia the poison is produced in the wound and in this type it is formed outside the body. The symptoms in this type comes on more slowly and insidiously and the disease is much more grave. The wound may be inflamed and angry looking, but usually there is no marked change; the chill is not severe, the fever may be elevated to 106-107 degrees F., or it may be sub-normal, 97-98 degrees F., and in this case the temperature never becomes normal, pulse weak, rapid, and as the disease progresses

becomes more and more irregular. All surgeons agree that septicemia, with a good pulse and high temperature, is more favorable to the patient than septicemia with a low temperature. The face has a peculiar look, it is a gasping white, pallid and drawn with dark circles around the eyes, there is indifference, apathy, says he feels well, soon the brain breaks down, and he mutters deliriously, the skin is yellow, cheeks flushed, anorexia, nausea, vomiting and there is diarrhœa in half the cases, the urine is concentrated and loaded with urates.

Diagnosis.—It is differentiated from sapremia by not finding dead tissue in the wound, and by the symptoms coming on slowly. It can be differentiated from Typhoid fever by Typhoid fever having a prodromal stage, with a gradual rise of temperature. The most important symptom in the diagnosis is the mental condition.

Prognosis.—The prognosis depends on the intensity of the poison and the resisting power of the patient, but is always very grave.

Treatment.—All we can do is to assist mother nature, the poison is being generated in all portions of the body and cannot be benefited by surgery. The prophlactic treatment consist of the proper treatment of the wound; keep it clean and prevent the entrance of the germ by appropriate antiseptic applications. The curative treatment consists of the local disinfection of the wound, and as soon as the disease develops give perfect drainage, which in all probabilities should have been done at the time of the operation, but was neglected. Administer tonics, stimulants and highly nutritious food. If possible the new serum treatment should be tried.

LECTURE XXII.

PYEMIA.

Pyemia is caused by the entrance into the circulation of pus or the products of pus, and is characterized by recurrent chills, intermittent fever and by the formation of metastatic abscesses on different portions of the body. This disease was frequent before the advent of antiseptic surgery, but is almost unknown at the present day.

Causes.—The essential cause is the pus microbe. It invariably occurs after suppuration; this has been proven both clinically and bacteriologically. In every case the streptococcus or the staphylococcus has been found in the blood. Some observers claim that the streptococcus is the microbe concerned, others that it is the staphylococcus, but in reality both are concerned; the streptococcus being found more abundant in the acute malignant type and the staphylococcus in the more chronic type which sometimes yields to treatment. Koch injected pus from a pyemic abscess into an animal, and an ordinary suppurative abscess resulted, pus from this was injected intravenously causing all the evidences of pyemia. The predisposing causes consist in the localization on the body of a suppurating wound near a vein. The disease does not occur in every case of suppuration, but if the suppuration is deep, as in a bone, the pus is more liable to enter the circulation.

Pathology.—We have a wound either surgically or accidentally inflicted which becomes infected with the pus germ. The germs proliferate, causing suppuration, this gradually extends through the tissues until a vein is reached; the tunica adventitia is attacked and finally the tunica intima is reached causes Phlebitis. The tunica intima becomes rough, causing the white corpuscles to accumulate on it, forming a thrombus, which extends along the vein toward the heart. This is, of course an infected thrombus, which soon disintegrates and emboli are carried into the circulation, and being infected they cause an abscess wherever they lodge. The terms thrombus, embolus and infarction may need

some explanation. A thrombus consist in the formation of an intravascular clot. It may be caused by any irritant applied to or near a vessel, which causes roughening of the tunica intima and corpuscles accumulate, causing a clot (so it is obvious that the fluidity of the blood depends on the smooth healthy condition of the lining of the vessels). There are many kinds of thrombi, Arterial, Venous, White (when composed chiefly of white and third corpuscles), Red when composed chiefly of red corpuscles, Parietal when it occupies the side of the vessel and Obstructive when it entirely closes the lumen of the vessel. A thrombus, if not infected, may undergo resolution, but if infected it disintegrates and an embolus results. When a thrombus grows rapidly and reaches a bifurcation of a vein, its point projects into the vein with its rapid flowing blood, and the end is broken off and carried into the circulation, and this constitutes an Embolus. An embolus then consist of a small foreign body in the blood. It goes through the heart into the lungs, here it usually lodges unless it is small enough to pass through the capillaries, when it may lodge in the liver, kidney or spleen. Fat may cause an embolus, as after a fractured bone, but in each case the result is the same, no matter where it lodges the blood is cut off from the distant tissues supplied by the plugged artery, constituting an Infarction. An infarction is a bloodless or anemic part of an organ, caused by the occlusion of the nourishing vessel by an embolus. The bloodless part is triangular, apex toward the plug, base looking away from it. As soon as the plug forms, usually some capillary ruptures and blood is poured out into the tissues, this is called Hemorrhagic infarction. When an infarction occurs the collateral branches do their best to supply the part and in some organs it is accomplished, but in organs with terminal arteries like the kidney and spleen there is no means of establishing the collateral circulation and necrosis results, which if the embolus be aseptic will end in resolution, but if it be infected and therefore the seat of microbic growth, the dead tissue will be attacked, causing suppuration, with the formation of metastatic abscesses at the seat of localization of the emboli and also in other organs.

Symptoms.—It can be inferred from the cause that the disease does not rapidly follow the infection of the wound, as it always

follows suppuration and time must be given for the germs to get in their work. It usually occurs from nine to ten days after the infliction of the wound. In about six days after the infliction of the wound the patient becomes restless, anorexia and great thirst comes on; when the wound is examined you will not find a laudible or so-called healthy pus, but there is a sanious, serous, ill-smelling fluid escaping, the part is swollen, lips of wound everted and the granulations have a yellowish-grayish cast. About the ninth day there will be a severe chill which will last about an hour, skin cold and pallid, but the thermometer shows a temperature of 103-104 degrees F. The fever continues four or five hours and gradually drops, but never leaves entirely. Then comes profuse perspiration and depression. The fever is not intermittent, but remittent in character, and the chills recur at irregular intervals, from one to three a day. The pulse keeps pace with the temperature, but is always weaker and quicker than normal. The mental faculties are not affected, there is no stupor, unconsciousness, nor apathy, the patient fully recognizes his position. In the later stages the great exhaustion and prostration brings on coma, in which state he dies. The digestive system is not seriously disturbed, there is loss of appetite and thirst, but no diarrhœa. The skin is peculiarly changed, it is yellow, simulating jaundice, but the white of the eyes are not affected, as in jaundice. In a short while abscesses will occur in various portions of the body and the symptoms depend on where it is located; if in the lungs, there will be difficult breathing and increased dullness on percussion; in the liver there is localized peritonitis; in the spleen, there is increase in size of the organ and tenderness; if in a joint, the symptoms will be those of suppurative arthritis.

Morbid Anatomy.—In making a post-mortem you will find a wound on the body which has suppurated and close by you will find a vein with clotted blood in it, trace the clot up toward the heart and its apex will be found projecting into a bifurcation of the vein and its end broken off. The lungs have a number of abscesses in it, usually at the periphery beneath the pleura, the liver and spleen is also studded with abscesses and some joint filled with pus.

Diagnosis.—The diagnosis is based on the history; on the fact of a suppurating wound, a sudden chill, with repetition of same at irregular intervals, variable temperature, prostration, yellow skin and on the abscesses on various portions of the body.

Prognosis.—The prognosis is based on the acuteness and intensity of the disease. Acute pyemia usually terminates fatally in five or six days. In the chronic type, where the fever is not high and abscesses do not form, the prognosis is not quite so grave.

Treatment.—The prophylactic treatment is the most important and on this I would lay particular stress, as we can prevent the disease, but are powerless in curing it. Prevent suppuration and you prevent pyemia, and to prevent suppuration you must carry out the laws of asepsis, which have been laid down in a previous lecture. If the disease developes, you must do rigid secondary sterilization; curette the wound, disinfect with a strong bi-chloride solution or chloride of zinc, and dress antiseptically. Some surgeons ligate the plugged vein, others amputate, but it is best to dissect out the clot. The local treatment at any rate can't be relied upon, and we have to depend on constitutional remedies, tonics as quinine, gentian, nux vomica, etc.; stimulants as whiskey, which must be given in unmeasured quantities, strychnine, digitalis and good nourishing food.

When secondary metastatic abscesses occur, incise freely, irrigate and drain. When suppuration exist in any cavity it should be treated as laid down previously.

LECTURE XXIII.

ERYSIPELAS.

Erysipelas is an acute non-suppurating inflammation of the skin, characterized by a crimson blush and a continued fever.

Cause.—This disease has long been known, but only recently has it been proven to be of microbic origin. It has long been known to be a contagious disease and with the discovery of its microbic origin many experimenters attempted to isolate the germ, but not until 1883 was it isolated, and then by Fehleisen. It is almost identical with the pus germ, being slightly larger than the

streptococcus pyogenes and a little larger than the staphylococcus. It is a round germ, multiplies by fission or direct segmentation and forms serpentine chains. It grows in all media, the most favorable temperature is 85 degrees F., and there is no growth at or above 104 degrees F. Owing to the fact that the germ resembles the pus germ, many observers claim they are identical, but they are distinct; the germ of erysipelas does not produce pus, and when pus does occur in an erysipelatos wound it is because it has also become infected with the pus germ.

Pathology.—When erysipelas starts, it is due to the entrance into the skin of the streptococcus erysipelatis, and as the unbroken skin acts as a barrier to the germs, there must be some breach of continuity. After entering through an "*Infection Atrium*," it localizes, in the superficial lymphatics of the skin and produces its effects. The germs are immovable, but they proliferate so fast that the disease rapidly spreads in the direction of and also against the lymph stream, and its current is soon stopped. The germ is exceedingly short lived, not being able to live in the same locality over three days and therefore it travels from one point to another, like a tramp in quest of food. For the foregoing reason, remedies are applied to prevent their migrating and thus checking the disease. Some observers claim that when localized the leucocytes kill them; while others say that on account of being so vigorous they soon exhaust the food at the point of localization and then they move to better supplied parts for their food.

Symptoms.—*General.*—The disease has a sharp period of incubation, which has been proven by observation on man and experiments on animals to be from fifteen to sixty-one hours. After this time the symptoms are ushered in by a chill, which is sometimes replaced in children by convulsions, there accompanies the chill its characteristic phenomena, pain in the back, pallid skin and sunken eyes. As reaction comes on the fever rises to 102-108 degrees F., and never ceases until the disease is eradicated, it is intermittant but continuous. The pulse is at first quickened, but in a few days becomes weak from the effect of the poison on the heart. The respirations are quick, shallow and irregular. The stomach is horribly upset, there is anorexia, nausea, vomiting and diarrhœa.

Local.—When you find a patient with the above symptoms, if he has been recently operated on, examine the wound, and if he has been accidentally injured he will direct your attention to the wound, which he says, is tingling, burning and smarting. On examination you will find a wound with a crimson blush, which is at first limited, but it gradually extends to neighboring tissue. It steadily progresses in a zigzag manner, the division between it and the healthy tissue being well marked. The part is swollen, its extent depending on the tissue involved; if it is loose it will be considerable, if tight it will be moderate. The pain is severe, and is described as a burning, tingling, scalding pain. The tissues feel tight and drawn. When the disease has nearly run its course there will be desquamation. The wound will never show pus unless there is double infection. If the disease be watched in three days it will be noticed that the primary focus has healed, the germs having exhausted the food at that point and a new field will be invaded. So if the proliferation of the germs can be prevented you can cure the disease in three days, but if this is not accomplished the disease will last for weeks.

Varieties.—There is but one variety and but one germ, but the following divisions are made according to difference in degree and clinical features.

Phlegmonous Erysipelas.—This is a type of the disease where we have the co-existence of suppuration and erysipelas at the same time and same point, due to mixed infection. There are all the symptoms described before, and in addition there is pus. This is the most dangerous type of erysipelas. The symptoms of erysipelas are overshadowed by those of suppuration and there is danger of the disease terminating in Pyemia or Septicemia.

Facial Erysipelas.—The medical fraternity speak of this type as Idiopathic erysipelas, which means the disease is of spontaneous origin, occuring without an "*infection atrium.*" This theory is absurd, a relic of ignorance, nothing arises spontaneously and the term *Idiopathic* is now being obliterated from medical literature. There must be an "*infection atrium*" through which the germ may enter or else there will be no symptoms of erysipelas. Often on close examination it is difficult to find a breach in the skin, but on close scrutiny around the alae of the nose it can be found or it

may have been so minute that it has healed before the onset of the disease In about fifteen to sixty-one hours after the infection there is a chill, followed by fever. The skin near the nose will show a crimson blush and there is nausea and anorexia. The disease gradually extends to the cheek, then to the soft tissues around the eye, which may become so swollen as to close the lids; it then crosses over the nose to the other eye and cheek, then it runs up on the forehead along the hair to the back of the ear, finally coalescing behind the head. Strange to say it never attacks the chin or the posterior surface of the neck. This type of the disease is usually self-limited and ceases in about ten days, causing little anxiety, although the disease may become very serious by the germ extending to the brain through the lymphatics, causing meningitis. This complication can be readily recognized by the fever being accompanied by delirium which does abate with the disease.

Erysipelas Neonatorum.—This type of the disease was formerly very common, but is rarely seen now. It attacks the umbilical cord of new born children and was of frequent occurrence in "*lying in hospitals*" before the days of antisepsis and asepsis. Soon after birth there appears a crimson blush at the umbilicus, which gradually extends around the body, there is a chill or convulsion and bullae form. This type usually ends fatally.

Erysipelas of Mucous Membranes.—This type attacks mucous surfaces as the mouth, tonsils, rectum or vagina. The symptoms are the same as delineated above, except on account of the natural crimson hue of mucous membranes this symptom can't be observed. Neither does it show on negroes when attacking the skin, and we diagnose by general symptoms.

Diagnosis.—The diagnosis in well marked cases is plain. The fact of the patient having a wound or an "*infection atrium*," the chill, fever, crimson blush around the wound, which extends in a zigzag manner, swelling, heat and a burning, scalding pain. It is differentiated from Erythema by finding healthy tissue between the red discoloration of the skin, whereas in erysipelas the discoloration is uniform; from Lymphangitis, by its attacking the superficial lymphatics, whereas lymphangitis attacks the deep lymphatics, but in reality it is nothing but a superficial lymphangitis. Phlebitis can be differentiated from it by the red color fol-

lowing the anatomical course of the veins and the veins in phlebitis feel like cords. Phlegmonous inflammation can be differentiated by its starting deep down in the tissues and approaching the surface, while erysipelas starts superficially and penetrates deeply.

PROGNOSIS.—The prognosis is good in uncomplicated erysipelas, but very grave when there are complications, such as suppuration, pyemia or septicemia.

TREATMENT.—Twenty years ago erysipelas attacked the wounds in half the operations, but since the advent of aseptic surgery the disease has been banished, and when it does occur it is due to bungling and dirty work. Treat wounds and make wounds by the laws laid down previously, and you will never have erysipelas. If the disease does develop, the treatment must be both local and constitutional. The local applications are numerous, almost every drug in the pharmacopeia has had their endorser, which shows there is no specific, and as erysipelas is a self-limiting disease you can't put much dependence in drugs. Those mostly used at present are Iodine, Nitrate of Silver, injections of Carbolic Acid, and Bi-chloride Mercury, Oxide Zinc, Ichthyol, hot and cold applications and numerous others. Take my advice and leave these drugs alone and practice the following: Render the part clean with green soap, wash then with alcohol, and then use a bi-chloride solution to kill any pus germs that may be lurking around and thus prevent complications. Now apply a compress saturated with a hot antiseptic solution; apply it this way, take a thick wad of cotton and some feeble antiseptic solution, such as 1-1000 bi-chloride, 1-200 carbolic acid or acetate of aluminum and place it in a pan and heat it continually over an alcohol lamp, wring out the cotton pad and apply to the part; repeat every hour. The object of this treatment is thorough cleanliness to prevent complications by the pus germ, heat lessens pain and you exterminate the germs of erysipelas as it can't stand a temperature over 104 degrees F., and the solution must be up to 110-120 degrees F.; the temperature of the skin is thus raised above 104 degrees F. and the germs are killed. Never use salves or caustics. Constitutional remedies must be given to preserve the strength. Give stimulants in large quantities, good easily digested food and tonics as quinine and iron. Never use the coal tar products, they are too depressing. Give opium for the

pain, of which Dover's powder is the best. If complications occur treat them on general principles.

Curative Power of Erysipelas and Its Therapeutical Use.—It was observed many years ago that patients suffering from cancer which resisted all remedies, when attacked by erysipelas were cured of the cancer, that sarcoma of bones was cured by an attack of erysipelas, etc. A German physician observed in the case of his son, who was nearly dead from diphtheria, that after he was attacked by erysipelas of the mouth in the course of the disease, that the membranes were thrown off and the son recovered. And so it has been found that the germ of erysipelas is antagonistic to the germs of many diseases. Many patients have been killed by injecting the germs of erysipelas into them for the cure of cancer, but now we are using their toxins instead of the germs, and the treatment is not so dangerous. Dr. Kohle, an ardent supporter of the antagonism of this germ to the germ of cancer, reports two or three hundred cases of cancer, which had been given up as past the pale of surgery, which he treated successfully by inoculating them with the mixed toxins of the Streptococcus erysipelatis and Bacillus prodigiosus. Other doctors, viz.: Senn, of Chicago, and Keen, of Philadelphia, have tried Dr. Kohle's treatment without success. In spite of the results attained, I believe we are on the verge of a great discovery for the cure of this disease, as well as for diphtheria. The toxins, when injected into man, do not produce erysipelas, but their chemical properties has a deleterious effect on the germs of cancer and diphtheria.

LECTURE XXIV.

TETANUS—SCURVY.

Tetanus or Lockjaw is an infectious disease, in which the germ that produces it acts on the Cerebro-spinal nervous system, producing rigidity and spasms of definite groups of muscles. This disease has long been known and was supposed to be due to nervous reflex irritability from a wound to the centers. This theory is still held by some, but has been abandoned by the better informed surgeons. It is now known to be an infectious disease, due to a specific microbe; the following observations should convince the most skeptical: A bullock which had died from lockjaw, was eaten by a lot of slaves and every one of them died from the disease, showing that there was some specific poison in the meat. A horse, having died from lockjaw in a certain stall of a stable, which was afterwards used by a bitch in having puppies, seven of the pups died from the disease, and the children that played with them also contracted the disease. Recently it has been recorded where a woman, while walking across a barn yard, fell and wounded her elbow, she contracted lockjaw and died; on investigation it was found that not long before a horse had died of tetanus in the yard, and the germs were planted in the soil and in this way she contracted the disease.

Cause.—The disease is caused by a specific microbe. It is due to the many experiments of Nicolaier who, in 1884, published his discovery of the germ. He proved that it is a bacillus, rod-shaped and is peculiar in having a spore near one end, which gave it the appearance of a drum stick. It is an anaerobic germ, and therefore requires the exclusion of oxygen for its growth, and this is an important point to remember in the treatment. Great difficulty has been experienced in its cultivation; it grows in sterilized blood serum and in gelatin after the addition of grape sugar; it grows best at 80 degrees F., but will also grow above and below this; it is the most resisting germ we have to deal with, but is killed after ten minutes boiling or steaming; it multiplies by spore formation

and grows in man only when inoculated deep enough to be out of contact of oxygen. This germ is exceedingly common and widely distributed, being found in manure, street dust, garden soil, old mortar and bricks. Owing to the fact of its being an anaerobic germ, infection is rare, except when a deep soil is upturned. There is on record a very peculiar coincident. During an earthquake there was demolished two old stone churches, which were only a few miles apart. In each there were two or three hundred worshippers, and a great many were injured. In one case seventy were injured, out of which forty died of lockjaw; while one hundred and fifty were injured in the other case none contracted the disease. On examination the bacillus of tetanus was found in the former case and none were found in the latter. The germ can't enter the body unless there be an "*infection atrium*," there is no such thing as idiopathic tetanus. The germ proliferates and grows, but is not disseminated through the body, it localizes and is never found in the blood. The symptoms arise from the absorption into the system of the toxins or ptomaines produced by the germs. Their toxins are described as being of four kind, and different symptoms are given for each, but this is too theoretical to indulge in. The germ may enter through any abrasion, but usually gains admittance through wounds on the feet or hands, as these members are more liable to both injury and infection. It occurs in men oftener than in women, on account of their being more liable to injury. It is most frequently seen in jockeys, stable boys, gardeners and street cleaners, who by their occupation, are more exposed to the germ. The wound must be a deep punctured wound, so as to exclude oxygen.

Clinical Varieties.—1. Acute. This develops only a few hours after the infliction of the wound. The symptoms are severe and intense, ending in great prostration and death. 2. Chronic. This comes on in two or three weeks after infection. The symptoms are less severe and recovery may occur. This difference in type is either due to the difference in the virulency of the germ or to the resisting power of the patient.

Symptoms.—Suppose a man working in a garden sticks the prong of a rake in his foot, or in walking across a barn yard sticks a nail in his foot. In two or three weeks he becomes indisposed, cross,

irritable, under the weather, despondent, forbodes evil and anxiously ponders over his condition. He complains of chilliness and slight stiffness about his neck, he tries to eat and accidentally discovers that he can't open his mouth sufficiently to drink or to receive his food. There is no pain or swelling, nothing abnormal is found except the inability to open his mouth, due to rigidity of the muscles of mastication. He becomes alarmed and sends for the doctor or treats it lighty and irons his neck for "*Crick*" in the muscles. Soon, however, there is pain, the stiffness of the neck increases and the jaws are firmly locked; the muscles of the back now become involved, they contract and as a result the head is thrown back, the spine is arched and the body assumes the position known as Opisthotonos, the head and heels being the only parts touching the bed. The muscles of the thorax next contract, then the diaphragm, which results in obstruction to respiration. The face has a peculiar look, the muscles are contracted, no expression and the risorious muscle contracting, produces the ghastly grin called "*Risus Sardonicus.*" There is pain through the whole body and the slightest noise or touch or even a draught of air throws him into a convulsion. He has no control over his urine, can't eat or take any nourishment, the pulse is quick and weak, the temperature may be up to 103-108 degrees F., respirations shallow and labored, and he finally dies from the excruciating pain, exhaustion and starvation. Chronic tetanus only differs from the above typical case, in not being as intense, the jaws not so firmly locked, slight stiffness about neck and there are no convulsions.

Diagnosis.—The positive diagnosis is easy. The fact of there being a wound which was inflicted by a nail or a rake which is contaminated by the germs of tetanus. On the symptoms, jaws locked, muscles contracted, etc. The differential diagnosis is more complicated. It may be confounded with hysteria, especially in young girls, where the jaws are locked, but you differentiate it by the jaws not being firmly locked, no fever and by there being no marked change in the pulse. It can be differentiated from strychnia poison by the history, and in strychnia poison the convulsions come on as soon as the drug is taken, in tetanus they come on from day to day, and in strychnia poison the jaws are rarely involved.

It can be differentiated from hydrophobia by the history, the person having been bitten by a rabid animal. In tetanus the period of inoculation is much shorter and the muscles of mastication are effected, whereas in hydrophobia the muscles of deglutition are involved.

Prognosis.—Seventy-five per cent. of all cases die. One writer says that all cases that resist the disease for five days get well. In the acute form all die, while in the chronic type a great many recover.

Treatment.—*Prophylactic.*—This treatment is of the greatest importance. Twenty years ago half the operations were followed by lockjaw; surgeons of repute lost as many patients from it as those of non-repute, and patients were always informed that tetanus was one of the dangers of the operation. To-day surgeons never fear lockjaw if they do aseptic surgery. If a patient comes to you with a dirty punctured wound, it is your duty to sterilize it to its utmost depths. Don't depend on sticking a syringe in the hole and throwing antiseptic solutions into the wound, but split the part open, remove every particle of dirt, disinfect it with bichloride mercury 1-2000, pack with antiseptic gauze and allow access of oxygen. This procedure looks cruel, but it is your duty; tetanus is still a common trouble, and if in every twenty punctured wounds you prevent one case by the operation, you save one life and give the others a wound which may be a little longer healing.

Curative.—When a case develops, and in the acute form, you can do nothing but administer an anodyne and give him an easy death. If it is in the chronic form, give chloroform for the pain (this is the best drug in both forms), as soon as the convulsions commence, give it continually, if you are compelled to leave get your assistant to administer it. Don't give it to the extent of complete anæsthesia, but give it like you would in an obstretric case. Give morphia and atropine, which acts well in conjunction with the chloroform ($\frac{1}{4}$-$\frac{1}{2}$ grain morphia to 1-150 grains of atropia and repeat in three hours). Give by rectum 30 grains each of chloral hydrate and bromide of potash. Give good nourishing food In mild cases, pull out a tooth and feed through the hole or introduce an elastic catheter through the nose, through the œsophagus into the stomach and give through this one pint of egg nog every four

hours. In some cases neither of the above will do, then resort to enemas. Most doctors have no faith in enemas, but a patient can be kept alive and in fact will fatten on nutrient enemas if properly administered. In giving an enema, remember that the rectum can't digest food, but it will absorb it, if it be predigested. Don't give over three enemas in the twenty-four hours, or you will irritate the rectum and it wont retain the food. Wash out the rectum once in twenty-four yours to remove the food which has not been absorbed and will ferment if allowed to remain. Don't give over four to six ounces at a time, and have it about the temperature of the blood. Food material can be used to suit the patient's purse and the fancy of the doctor, but any predigested nutritious food will do. Never put pure milk into the rectum, as it will not be absorbed, predigest it with pepsin. Valentine's meat juice is good. The most satisfactory enema I have ever used is as follows:

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Whiskey	℥ss (½ ounce)
Yelk of egg	No. 1
Valentine's Meat Juice	℥ss (½ ounce)
Peptonized Milk	℥iv (4 ounces)

Beat the yolk, add the whiskey and beat until the egg is cooked, add the meat juice and milk hot, put in a tumbler until it is the temperature of the blood, then with an ordinary syringe with a catheter attached throw it into the rectum. This is about all you can do. It is absolutely necessary to have a good nurse, make her wear rubber shoes, darken the room, stop all talking and noise and some cases will recover. Try the new antitoxin that has just come out.

SCURVY.—This disease is not due to a germ. It is a constitutional disease caused by improper diet or to bad hygenic surroundings. It is characterized by interference with nutrition and by hemorrhages in various portions of the body. The disease was unknown before the fifteenth century, but with the discovery of America, with the extension of navigation, with the advent of the spirit of venture into the Artic region the disease developed and has raged in epidemic form very often since. Northern writers, in dealing with this subject, seem to take a peculiar delight in mentioning the epidemic at Hendersonville as an example of privation,

neglect and cruelty. This comes with very poor grace from a class of people who refused to send palliative drugs and food, and who would not allow their own surgeons to administer help to their suffering brothers, when both of these privileges were extended to them.

Cause.—It is caused by the food not containing a sufficient amount of vegetable acids, by eating continually nothing but canned goods and drinking impure water, etc. People who live in pens, prison's and in ships, where the bilge water is foul are those who contract the disease.

Symptoms.—The disease comes on slowly. A sailor who has been active, strong and robust aboard some ship, becomes sloathful, drowsy, depressed, loses strength, pain in his back, skin yellow and sallow, finally becoming scaly and cracked, his gums become tender, œdematous, blue in color and bleeds easily; the skin then becomes spotted, petechial spots appear at the base of the hair, these desquimates and finally ulcerates; the heart is weak, he becomes emaciated and dies from prostration.

Diagnosis.—The diagnosis is based on the history and symptoms. It can be told from Purpura Hemorrhagica by the cachexia, persistent pains and fetid breath, and from Anemia by the microscope.

Prognosis.—The prognosis depends on the stage in which you see the patient. If you see him in the early stage, it is good, but if you do not see him until the later stages it is exceedingly grave.

Treatment.—The prophylactic treatment consists in having proper food and proper hygenic surroundings. If a ship is going off on a long voyage, it should be well ventilated, stock it with live stock, fresh food and pure water. Amongst the most valuable antiscorbutics are: Eggs, milk, onions, potatoes, turnips, cranberries, limes, lemons and sourkraut. If the disease developes the curative treatment consists almost exclusively of dietetics; give the above-mentioned articles of diet and also give medicines as tonics. Use antiseptics on the ulcers to prevent gangrene.

LECTURE XXV.

WOUNDS.

A wound may be defined as a sudden solution of the continuity of soft tissues. This definition excludes fractures, although a fracture is a wound, but not of the soft tissues, and will be discussed elsewhere. An ulcer, technically, is not a wound, because it is produced by slow disintegration and not by sudden solution of the tissues. The term "*Wound*" applies to some external mechanical force or violence which rents the tissues. The frequency which wounds occur, and the number of times you will be called to treat them, show their importance.

Varieties.—Wounds are divided into accidental, operative, open, subcutaneous, aseptic and septic. Accidental wounds are wounds inflicted accidentally by some unexpected violence. Operative wounds are wounds made after careful consideration to relieve pain or to save life. Open wounds are wounds in which there is a breach in the skin or mucous membranes, and is exposed to the air. Subcutaneous wounds involve the subcutaneous tissues, the skin or mucous membrane remaining intact, as the rupture of a muscle or tendon, and not being in contact with the air they are not infected by germs. Aseptic wounds do not become inflamed on account of the pyogenic germs being excluded when the wound was inflicted, by nature's resisting the action of the germs or by the use of antisepsis and asepsis which prevents inflammation. Septic wounds are wouds which, at the time of infliction or afterwards, have become infected by pyogenic germs which produce inflammation.

Cause.—The causes are too numerous to mention. But all wounds are due to some sudden application of mechanical force. It may be by a knife, brick bat, club, pistol ball, or an arrow or any mechanical force.

Pathology.—The pathology is the same, no matter what the location or cause of the wound, and the process of healing is also the same viz.: Surgical regeneration. In every wound there is

death of cells in proportion to the cause; in a wound made by a sharp knife, the death is limited to the cells traversed by the sharp edge, whereas a wound made by a brick bat, the death of the cells is much more extensive; but in each case the pathology is the same, there is death of cells which are replaced by granulation, vascularization, cicatrization and epidermization.

Symptoms.—The symptoms are the same in all wounds, viz.: Pain, Hemorrhage, Gaping and Impairment of function. Every wound is accompanied by pain, the character and intensity varying with the cause, anatomical location and the susceptibility of the individual. A wound made with a sharp knife imparts to the brain a sharp, stinging pain, which soon becomes a smarting pain, and may last for hours and then subside. A wound made by a dull, bruising instrument, causes no pain immediately after infliction, but it comes on slowly, gradually growing worse. Some tissues give more pain than others when wounded; as a wound of the sensitive finger compared to a wound on the back. In some individuals the pain from the same wound is more acute than in others, and in the same individual under different circumstances, a nervous, debilitated person suffers more pain under the same injury than a robust, phlegmatic person, and the remark will be made that he had more nerve, but it is just the reverse. The same persons will suffer more on different occasions, as a man cut while his stomach is full and he is well stimulated will not suffer much pain, but the next day, if he is debilitated, he will suffer considerably. Hemorrhage is an invariable symptom and varies according to the force or instrument causing the wound and the constitution of the individual. If the wound was made by a knife, the hemorrhage occurs instantaneously, but if made by a cog wheel, it does not come on for some time, for the vessels are ground in two, the ends are lacerated and fringed and often the lumen of the vessel closed, but in a knife cut the vessels are cleanly divided and nothing is left to prevent the hemorrhage at once. Hemorrhage may be Arterial, Venous or Capillary, depending on the vessel cut. If an artery is cut, we have arterial hemorrhage, and the blood is of a bright, crimson color and comes in spurts. If a vein is cut, we have venous hemorrhage, the blood is of a dark blue color and welds up slowly and steadily. If a capillary is cut, we have capillary hemorrhage, the

blood is intermediate in color and comes to the surface like sweat. Gaping is seen in all wounds. This is a fortunate provision, as it provides for drainage. It is due to the elasticity of the tissues. The skin is the most elastic tissue in the body, muscles come next, and in a wound the skin retracts showing the muscles and the muscles retracting more than the fascia, show it beneath.

Complications.—*Local.*—Inflammation is not a natural sequence, but a complication due to infection, and the wound fails to heal by primary intention. It becomes red, swollen, œdematous and hot. The treatment consists in asepsis to prevent contamination and the general treatment for inflammation when it does occur as laid down previously. Suppuration is usually a sequence of inflammation. The wound becomes infected and inflamed, if the germ is virulent pus forms and you get fluctuation on palpation. The treatment consists of preventing the complication by asepsis, and when it occurs the general treatment for suppuration must be carried out. Gangrene occuring in a wound is a sequence of suppuration. The wound becomes inflamed, suppurates and finally there is death of the soft tissues, due to the virulency of the germ, pressure and to the direct action of the toxins generated. The prevention consists of the proper treatment of the wound, and when gangrene does occur carry out the treatment as laid down previously. Erysipelas may become a complication, due to infection by the Streptococcus Erysipelas. The treatment is the same as for erysipelas, given elsewhere.

Constitutional complications.—Shock may be a complication, due to the sudden infliction of the wound. The patient falls insensible, pulse irregular, respirations shallow, sub-normal temperature, pale face, etc. Treat as laid down previously. Traumatic delirium is seen after wounds to the genital organs or after severe pain. There is no fever, but the patient talks out of his head, tosses on the bed, mutters to himself and for days knows nothing of his condition. The pathology of this delirium is not known, it usually follows laparotomies for the removal of the ovaries. There will be little shock, but when the patient recovers from the anæsthetic this delirium comes on. Delirium tremens is a complication due to excessive drinking. It occurs in hard, continual drinkers, and is not seen in individuals who get on periodical sprees. A man who

takes five or six drinks a day, but who was never drunk in his life, if injured or operated on, is extremely liable to delirium tremens. A typical case was confined in the Virginia Hospital some time since. He was a respectable looking miner, and was suffering from a compound fracture. He was hardy and robust, but gradually became nervous and shaky. He said he never was drunk, but had daily taken ten drinks. This man might have gone on working in the mines all his life and not been bothered, but receiving this fracture caused the trouble. He commenced picking at the bed clothes, tried to take the splint off, saw women at the windows, snakes and rats in the room, and while the nurse was absent got up and walked around the room regardless of the pain. He had to be overpowered and tied in bed. The delirium comes on slowly, they answer questions intelligently, but remembers nothing about them afterwards. They always imagine they see women at the windows and reptiles in the room. Fat embolus may be a complication. An individual having received an injury which involves the fatty tissue or fractures a bone, macerating the fat in the medullary cavity, causing it to disintegrate and become partly liquified, the fat may enter some large vein or lymphatic and is carried to the heart. From there it is pumped into the lung, where it lodges in some small bronchiole, producing fat embolus. It usually occurs from twenty-four to forty-eight hours after the infliction of the wound. Up to this time the patient may have been doing well, when suddenly there is depression and accelerated breathing, quickened pulse and dyspnœa. The patient sits up in bed, gasps once or twice and falls back dead; or the embolus may be small when the symptoms are not so alarming and on examining the urine, fat globules will be found which has passed through the lungs and has been excreted by the kidneys. Septicemia, Pyemia and Tetanus may be a complication and has been fully discussed.

Diagnosis.—The diagnosis is simple, but is more difficult to tell the nature of the instrument producing the wound.

Prognosis.—The prognosis depends upon the nature, character and location of the wound.

Treatment.—*1. Local.—Arrest hemorrhage* and always use the simplest methods. Never apply heroic measures unless actually

necessary, as they retard healing. Elevate the part which acts by diminishing the "*vis a tergo*" and by favoring venous return. Pressure long and faithfully applied, either as a tampon, gauze or sponge. Heat and cold are useful, but cold devitilizes the tissues and retards healing; heat is very useful, apply a tampon, saturated in water at 110 degrees F., to the bleeding surface; it acts not only by contracting the vessel, but also coagulates the albumen of the blood. If all these means fail, use torsion or ligate the vessel. In using torsion, catch the vessel with a pair of haemostatic forceps, and twist it until the end in the forceps comes off. In ligating a vessel use aseptic cat gut or silk. Catgut is the best if you are sure it is aseptic, as it will be absorbed.

Secure Asepsis.—Make the wound clean, remove any gross impurities as glass, cloth, garden dirt, etc. If there are any slugs of devitilized tissue remove them. Now endeavor to render aseptic, go about this gently and never use antiseptics any stronger than actually necessary, a 1-1000 bi-chloride solution not only kills the germs, but all the cells it comes in contact with.

Effect accurate coaptation.—It is your duty to bring the surfaces in apposition accurately, muscle to muscle, fascia to fascia and skin to skin. If it is a trivial wound coaptation may be effected by placing strips of adhesive plaster on each side the wound, then stitch from one piece to the other or you can use colloidion and cotton. But wounds of any size require sutures. Use catgut or silk and not only suture the skin together, but to get perfect coaptation, you must carry your sutures deep into the tissues. If you do not carry your sutures deep enough you will have dead spaces in the wound, in which blood clots and serum stagnates, causing pain and a good media in which germs can grow.

Provide for drainage.—Owing to the fact that you can't get perfect haemostasis, you will have to provide for drainage or else the fluid oozing from the wound will collect and separate the lips of the wound and also cause severe pain. If you do not fear hemorrhage, use capillary drainage by inserting into the bottom of the wound and letting the ends project out, a strip of gauze or a bundle of catgut sutures. If suppuration or hemorrhage is feared, drainage tubes of rubber or glass are best to use. Remove the drainage tubes as soon as they have done their work, usually

after twenty-four to forty-eight hours, but no law can be laid down. Rubber tubes can be boiled to disinfect them without injury.

Apply a protective dressing.—The object of this dressing is twofold, it absorbs the secretions and prevents infection from without. Gauze or cotton can be used and should be impregnated with antiseptic solutions. The dressings should not be changed any oftener than necessary, but as often as the case demands. It should be removed if there is fever, pain and when it becomes saturated with the secretions. If none of the above occur, let it remain until healing occurs. In changing the dressing, observe carefully the laws of asepsis.

Maintain physiological rest.—Having carried out the above indications, put the patient in bed and maintain physiological rest. If the eye is injured, exclude light; if the ear, exclude sound; if the intestines, feed per rectum; if the bladder, give drainage.

2. General.—Relieve pain by giving anodynes, provided they do not interfere with important functions; as after a laparotomy you would not give opium, as it constipates when you wish free action of the bowels. Combat complications as septicemia, pyemia, erysipelas, etc., and when they occur, treat them as laid down previously. Encourage the patient, give whiskey as a stimulant and last, but not least, give plenty of good nourishing food.

LECTURE XXVI.

SPECIAL WOUNDS.

Incised Wounds.—An incised wound is a wound made by an instrument possessing a smooth, sharp, cutting edge, and is characterized by the fact that only the cells directly in the path of the instrument are killed. The wound does not slough and is easily repaired. Such wounds, if coaptation is effected, will heal in ten or twelve days by primary intention. These wounds build up a surgeons reputation.

Causes.—These wounds are either inflicted on the operating table by a surgeon with a scalpel or scissors, or accidentally by a sword, butcher's knife, hatchet or glass. They are constantly occuring and demand the surgeon's attention.

Symptoms.—The symptoms are pain, which is immediately felt, is sharp, severe and cutting in character, and unless the wound is infected subsides in a few hours; hemorrhage, which is profuse on account of the vessels being cleanly divided, the amount depending on the vessel cut; gaping is considerable, and is only limited by the contractility and elasticity of the tissues passed through.

Treatment.—As these wounds heal readily, the treatment is that for wounds in general. Arrest hemorrhage by pressure, elevation and hot applications, if these fail use torsion or ligate the vessel. Never use styptics, such as Persulphate iron, Monsel's solution, etc., it is true they arrest hemorrhage, but do so by destruction of the superficial cells, coagulating the albumen and thus retard healing. Secure asepsis by washing the wound and surrounding skin with green soap, alcohol and a bi-chloride solution. Approximate the surfaces, either by sutures, laying a piece of adhesive plaster on each side and stitch from one piece to the other, or by gauze and collodion. Never put adhesive plaster in direct contact with a wound, and it is not even safe to put it across a wound separated by gauze or cotton. Drainage is not usually necessary in these wounds. Apply a dressing of gauze or cotton and bind it firmly with a roller bandage. Unless one of the three indications, fever, pain and a saturated dressing be evinced, do not remove the dressings for four or five days, and in that time the stitches can be removed.

Lacerated and Contused Wounds.—A lacerated wound is made by some tearing force. A contused wound is made by some crushing force. It is at once evident then, from the causes of these two varieties of wounds, that they are always combined; an instrument that makes a tearing wound crushes at the same time, as a wound made by a cog wheel; and a force making a crushing wound also tears, as in a blow from a brick. The two then will be considered together. The characteristic of these wounds is the excessive destruction of tissue; cells distant from the wound are devitilized, causing necrosis and making it impossible for the wound

to heal by primary intention. The best that can be hoped for is that the devitilized tissue will separate by dry necrosis.

Cause.—These causes are numerous and have already been enumerated. These wounds are much more common now than they were twenty years ago, owing to the invention of large quantities of machinery.

Symptoms.—Hemorrhage is not great at the time of infliction, although large vessels may have been severed; this is due to the mechanical closure of the vessels by the grinding and pressure of the force causing the wound, and the ends of the vessels are left ragged, and the blood flowing over it causes it to coagulate and arrest the hmorrhage. But hemorrhage may come on later and it is your duty to find any large vessels that have been severed and ligate them. Shock is always present in this variety of wounds, but is seldom seen in incised wounds. This helps to explain why we have hemorrhage immediately in incised wounds and none in lacerated wounds, as in lacerated wounds the heart is depressed from shock, and is not in incised wounds. Pain is sometimes entirely absent, the severe injury obtunding the sensibility at the time, but there is excruciating pain soon after the injury.

Treatment.—All lacerated and contused wounds are infected, and the most difficult and important task is their disinfection. A man dragged underneath a car wheel has every description of filth in his wound, clothes, manure, cinders, gravel, etc.; a man injured by a cog wheel in a factory has dirty hands, besides the wound is contaminated by the filthy lubricating oil on the wheel. The first indication is to clean the hand, give an anæsthetic; grease the hand with sweet oil, this oil is also infected, but it removes the grease and dirt; now wash it with green soap and a nail brush, commencing six or eight inches from the wound and finally attacking it, then wash with alcohol to remove the soap and also for its antiseptic properties, and lastly wash in a bi-chloride or carbolic acid solution. Decide how you will treat the wound; if it is necessary amputate; if not, remove all the dead lacerated tissue with a pair of curved scissors, take out all splinters of bone, remove your tourniquet and tie all bleeding vessels. Never approximate the wounded surfaces, for it is almost impossible for you to remove all the dead tissue and it won't do to close the wound with dead

tissue in it. So leave it open, dust with Iodoform, pack with gauze and dress with plenty of absorbing cotton. Never let the dressing remain long enough to become saturated. Watch the patient, don't leave him unless you leave a competent nurse who can apply a tourniquet if necessary, as there is danger of sloughing or the heart's action becoming stronger after reaction, causing dangerous hemorrhage. If the wound be infected there may be necrosis or even gangrene. After healthy granulations appear, the wounded surfaces may be approximated by what is called secondary suturing.

Punctured Wounds.—These wounds are caused by pointed instruments. They are characterized by occupying only a small surface, but penetrating deep into the tissues, the outward appearance being no evidence of the severity of the injury.

Cause.—Any pointed instrument, as a needle, pin, stiletto or dagger. Wounds made by these instruments resemble incised wounds, as they are all clean, sharp edged instruments. A splinter of wood, nail or fence paling, causes a punctured wound, but they make wounds resembling lacterated or contused wounds, and therefore the nature of the wound depends on the character of the inflicting instrument.

Symptoms.—The symptoms depend on the location of the wound. Hemorrhage is not usually great, unless some great blood vessels lay directly in the track of the penetrating instrument and is punctured. The amount of pain depends on the nature of the instrument; if it is produced by a sword, the pain is considerable, but if produced by a dull instrument like a paling, the pain is not so severe. The amount of shock depends on the nature of the instrument, a sharp edge causing less shock than a blunt instrument. When an instrument like a dagger is stuck into a cavity, as the abdomen, and the point does not appear on the opposite side, it is called a Penetrating wound; if the point does show on the back or side, it is called a Perforating wound.

Treatment.—The treatment depends on the anatomical location and the nature of the instrument inflicting the wound. If the instrument punctures some important cavity or blood vessel interference is justifiable, but if the wound is made by a clean, sharp instrument like a dagger, and does not involve any important organ,

cavity or blood vessel, all that is necessary is to wash the surface of the wound with green soap, alcohol and a bi-chloride solution and apply an occlusive dressing. If the wound was inflicted by a paling or rusty nail, it is your duty to lay the wound open with a free incision down to the very bottom of the tract, thoroughly disinfect it, pack with gauze and allow it to heal by granulation. In a wound made by a knife, dagger or needle, the infection is wiped off ot it by the skin and clothes and superficial disinfection is all that is needed; but in the case of a nail or paling, the wound is infected to its very bottom, and you can't disinfect it without splitting the part open.

Gunshot Wounds.—On this subject volumns have been written, but now in these civil times their occurrence is so rare we need only give its consideration a passing glance. Gunshot wounds are caused by missiles that have been projected by force derived from explosives. They are characterized by partaking of the nature of both punctured and lacerated wounds; punctured because the missile penetrates deeply and only shows a slight wound on the surface; lacerated because the tissues are crushed and torn into.

Causes.—The causes are numerous. Any missile from a small bird shot to a mammoth shell. The most common causes are missiles fired from shot guns, pistols and rifles. A shot gun at short range makes a round hole like a pistol ball, and it is hard to tell one from the other. A pistol bullet varies from a 22 to a 48 calibre, which designates the diameter of the ball in decimals of an inch. They are usually round, and do not possess very great penetrating power. The rifle ball has changed considerably in recent years. They formerly weighed as much as an ounce, but are now only 30 calibre, coated with nickle, round or cone shaped and more penetrating than the old ball. A round bullet produces a contused bruised wound, whereas a cone shaped bullet acts as a wedge and produces a lacerated wound. The velocity of the old rifles was only two or three hundred yards; the new rifle's velocity is from one to two miles. In a smooth bore rifle the bullet rotates at right angles to its axis; a rifled bore causes it to rotate in a line with its axis. A round bullet produces ecchymosis at the point of entrance, mashes and lacerates the tissue, and has little penetrating power; the cone shaped bullet possesses great penetrating power and if it strikes a bone it shatters it.

Symptoms.—Pain is variable. Men in the excitement of battle have been shot without being aware of it. During the late war a gallant officer was shot through the tibial artery and never knew he was shot, until an orderly told him his boot was running over with blood. Other individuals will suffer horribly from slight wounds. The pain also varies with the kind of bullet struck with, a round ball causing more pain than a cone shaped ball. Old soldiers tell us they felt as if they had been struck by an axe when shot. The amount of hemorrhage depends on the anatomical location; if a large artery is severed, it will be severe and is greater in a wound produced by a cone shaped ball than when produced by a round ball. Shock is generally profound, especially in soldiers that have been fighting all day without food or drink. Thirst is an invariable accompaniment, but why, we do not know.

Injuries to Special Tissues.—When a person is shot, and the ball perforates the entire body, the point of exit will be larger than the point of entrance; this is due to the fact that the velocity of the ball is lessened and the skin at the point of exit has no support. It is the same principle as driving a nail through a plank, the point of exit will be larger and shattered from non-support. The skin is usually livid and soiled with grease from the bullet. The fascia is peculiarly affected; made up as it is of interlacing fibres of connective tissue, the ball does not tear through it, but pushes the fibres aside and the hole closes again. This is unfortunate, for it prevents drainage and is also a bother in probing for the bullet. It also may cause the ball to be deflected from its course, either lessening the injury or causing greater damage. Muscles are bruised and pulpified. Tendons usually escape the ball by slipping to one side. Blood vessels, if situated so as to be able to slip to one side, may escape, but the modern bullet usually penetrates them. Bones were only perforated by balls from the old rifles, but the modern rifles and balls splinter them into a hundred fragments; so in the next war compound fractures will be more common. Nerves are usually severed on account of being situated deeply, and often supported by bone. Great cavities as the skull or abdomen may be penetrated. The abdomen may be punctured, producing serious damage, although the bowels may be pushed aside and escape injury.

Diagnosis.—The diagnosis is based on the history; the fact of having been shot and on the appearance of the wound.

Prognosis.—The prognosis depends on the nature of the injury, temperature and anatomical location. If the temperature falls below normal, say 96 degrees F., the prognosis is very grave.

Treatment.—Stop the hemorrhage, relieve pain and combat shock; do all this on the field of battle or at the place of accident. There are many disadvantages in treating these wounds even in civil life. You are always called to the country or hunting field where you are not prepared for emergencies. But you should always be equal to the occasion; put on a tourniquet, give morphia for the pain and whiskey for the shock until you can remove him to better surroundings. The local treatment is all that is necessary, disinfect the wound and apply a dressing. Don't go probing after the ball, it will become encapsulated and do no harm, and if it does you can take it out when the patient is better prepared to stand the operation. The rule given to assistant surgeons United States Army is when a man is shot in battle, do nothing but arrest the hemorrhage, relieve the pain and combat shock, then send the man to the rear, and if he has no vital organ involved he is left unmolested. If called to a person shot in the brain or abdomen you must operate at once, and under the strictest asepsis. The finger is the best probe, and always use it, unless the tract is too deep; then use a Nelaton's probe, which is the best artificial probe we have; it expands into a bulb at one end which is covered with porcelain and when it comes in contact with the lead, marks are left on it. No two cases are treated alike, you must simply meet every indication. Disinfect the wound, making it larger if necessary with a free incision, remove the ball if indicated, arrest hemorrhage and apply an occlusive dressing.

LECTURE XXVII.

SPECIAL WOUNDS.—Continued.

Arrow Wounds.—Arrow wounds are wounds inflicted by arrows. They are characterized by the fact that they present features of both punctured and contused wounds.

Cause.—The cause is an arrow head of stone fastened to a shaft by leather fired from a bow.

Symptons.—The symptoms are those of a punctured and contused wound in general. The shaft is usually seen projecting from the wound.

Treatment.—An arrow head, unlike a bullet, will not become uncapsulated, and if allowed to remain in the tissues will cause suppuration, and therefore no matter where it is situated it must be removed. The common mistake is to try and withdraw the head by making traction on the shaft. Never do this, for you will pull the head from the shaft and thus lose the shaft as a guide in operating. If the arrow almost perforates a limb, it is best to push on the shaft until the head shows on the opposite, incise the skin and remove it. But if the arrow is stopped by a bone, you must dissect down to the head, following the shaft as a guide, remove it with forceps, disinfect the wound with a bi-chloride solution, pack with gauze and dress the wound. The rule given in case of a bullet wound on a battle field holds good here; do nothing on the field but relieve the pain, clip the shaft off two or three inches from the wound, put on an occlusive dressing and remove the patient to the hospital for further treatment.

Brush Burns.—This is a superficial abrasion produced by the contact of some rapid moving substance against the soft tissues of the body. They may be produced by the soft tissues coming in contact with a rapidly moving belt on a piece of machinery, a rope slipping rapidly through the hands or by an involuntary slide down an incline (as a cellar door). They are characterized by the fact that the superficial tissues, which come in contact with the moving body, is killed, leaving a deep eschar, with no hemorrhage, but

intense pain. Later the eschar sloughs, leaving a raw surface which heals slowly.

Treatment.—The treatment consists of thorough disinfection, the application of an antiseptic compress for two or three days, when the scab will be separated, then treat as any superficial exposed wound.

Dissecting Wounds.—Dissecting wounds are wounds caused by the introduction of septic material into the system from dead putrefying organic bodies. They occur chiefly in surgeons and students who conduct post-mortem examinations and in butchers and cooks, who handle putrefying organic matter.

Cause.—The exact nature of the poison causing the trouble is not known, it arises from putrefaction of organic matter. For the development of grave symptoms, the poison must be exceedingly virulent or the person infected must be in a state of lowered vitality. In a strong, robust individual, the symptoms are not marked; neither are they marked if the poison is weak and the individual debilitated, but if the individual is weak and the poison virulent, the symptoms are severe, and death often results. There must be an "*infection atrium*," for the perfect unbroken skin acts as a barrier against infection, but if a student is pricked by the point of a dissecting knife, or he has hang nails or a little sore on his finger, he is liable to become infected.

Symptoms.—The symptoms vary extremely. They may be from a slight irritation or suppuration to that of rapid progressive gangrene. Sometimes the wound becomes red, swollen and inflamed and then subsides; again, other cases will make rapid progress for the worse, red lines will mark the lymphatics near the wound; the part becomes œdematous and swollen, extreme depression and death follows.

Treatment.—Don't dissect or come in contact with putrefying organic matter with abrasions on the skin. But if while making a post-mortem examination, or while dissecting or handling putrefying organic matter an individual is wounded, you must heroically disinfect the wound. Withdraw the poison by suction, examine the wound, and if it is small and punctured, enlarge it and irrigate with a 1-500 bi-chloride solution or touch it with chloride zinc, dust with iodoform and dress. If no symptoms develop in three

days the patient is safe and must simply wait for the wound to heal, but if the above symptoms develop, and the wound goes from bad to worse, don't wait for the formation of pus, but make numerous free incisions through the inflamed tissues parallel with the long axis of the limb, and thus let the secretions escape; disinfect the part, apply occlusive dressings and treat on general surgical principles. If abscesses form on the body, incise and irrigate them. Give constitutional remedies, as the patient may have the complication of septicemia. Give quinine in tonic doses, iron to tone up the system and increase the red corpuscles, strychnia as a cardiac stimulant, whiskey and plenty of concentrated nourishing food.

Stings of Insects.—These are punctured wounds, inflicted by the bite of various small animals. Although trivial in most instances, as the bite of a flea, bed bug or louse, they are exceedingly painful when inflicted by a yellow jacket, wasp, bee and hornet. The bite of the spider, centipede, tarantulæ and scorpions may producel alarming symptoms. These wounds are characterized not only as a punctured wound, but by the injection of poison into the wound at the same time. The poison comes from some gland, may be mixed with the saliva, and it is important to know in the treatment that the poison from all insects is acid in reaction.

Symptoms.—The symptoms depend on the animal inflicting the wound. The local symptoms are a mild inflammation, irritable pain, heat and swelling. If the wound be examined, it will be found to be a small puncture and the sting will be protruding from it. The constitutional symptoms are cardiac depression, interference with respiration, collapse and in some cases death results.

Treatment.—Examine the wound and remove the sting, disinfect and apply an occlusive dressing to prevent infection. Relieve the pain by the use of some alkali, as ammonia or bicarbonate soda. Prevent complications. If the wound is made where the above remedies can't be had, make a poultice out of the soil and apply it to the wound to relieve the pain. The constitutional treatment consists of meeting the symptoms as they develop, strychnia for cardiac depression and quinine as a tonic.

Bites of Serpents.—These are wounds inflicted by the fangs of poisonous snakes. They are rarely seen in this section, but are

common in the mountainous regions of Virginia and North Carolina. The importance of this subject will be recognized when you learn that in India 20,000 people die annually from snake bites. In India twenty poisonous varieties are known, whereas in this country we only have four, rattlesnake, adder, moccasin and in Texas the "Gila monster." Of course, there are many different varieties of each of the above, but there are only four great families. The poision from each are almost identical in nature, the treatment for each the same, and therefore they will be considered together.

Description.—A poisonous snake is always short, with a blunt tail and a coffin shaped head. The upper jaw is movable. being on a joint, so that in addition to opening its mouth with its lower jaw, it can raise the upper jaw and can therefore swollow an object as large as its head. This arrangement of the jaw is peculiar to the snake and crocodile. Snakes have teeth, but they do not use them in inflicting wounds. For inflicting wounds they have fangs, which occupies the position of the canine teeth of the upper jaw; they are about three-quarters of an inch long, sharp pointed and curved like a scythe. They are not hollow, but mucous membrane runs down behind them and thus converts them into a kind of hypodermic syringe. They are movable, and when not in action lay back on the roof of the mouth. They are two in number, one on each side. The poison is contained in a sack situated behind the eye, which communicates by a duct (which has a sphincter muscle, so as not to allow the poison to escape except when voluntarily relaxed) with the canal behind the fang. The poison varies in color from a pale green to a dark orange, it is thick and transparent, resembling light molasses. It is of an acid reaction and from ten to fifteen minims in bulk. The venom is the most powerful organic poison known; chemists have tried to analyze it without success. One chemist says that rattlesnake poison contains two proteids, which causes its dangerous effects. The poison acts on tissues peculiarly. It causes necrosis of the cells that it comes in contact with and produces uncoagubility of the blood. A case in which death resulted on post-mortem the blood was found perfectly fluid, and would not coagulate after exposure to the air in cans. The red corpuscles lose their shape, disintegrates and run to-

gether. The capillaries lose their elasticity and not being able to withstand the blood pressure, the blood is forced out into the tissues. The poison acts too quickly for inflammation to occur. When a snake bites he does so in this way: Seeing an approaching enemy, he curls up, only leaving his head and about two inches of his body out, his tail vibrates, head moves from side to side, eyes flashes, the body becomes stiff and the muscles of the back acting, sends the head forward, burying the fangs deep into the enemy; he then shakes his head from side to side to extricate the fangs. A snake can't jump over two-thirds his length, and can't bite while running; he must be coiled up.

Symptoms.—*Local.*—Examine the wound, and it will show two parallel punctures about one inch apart. The surrounding tissues are black, gangrenous, swollen, œdematous, and soon disintegrate. The pain is severe and gradually grows worse. *Constitutional.*—There is giddiness at the time of infliction, becoming fainty, nauseated, the skin is cold and clammy, heart weak and intermittent, respirations depressed, delirium, collapse, coma and death from paralysis of respiration.

Diagnosis.—The diagnosis is based on the history, local symptoms, a double punctured wound, change in the tissues and on the snake itself.

Prognosis.—The prognosis depends on the variety of snake inflicting the wound and the amount of poison injected. The bite of a Cobra is always fatal, whereas a rattlesnake bite need not be fatal if heroic treatment is adopted. A snake has but ten drops of poison, and if the wound was inflicted through the clothing, part of it will be lost or if the snake bites the dog which is accompanying the hunter, and then bites the hunter, the prognosis for the hunter is good, but bad for the dog, as the dog received nearly all the poison from being bitten first.

Treatment.—The treatment must be prompt and heroic. Apply a tourniquet at once between the wound and the heart. On account of the length of snakes in this country and their inability to reach over two-thirds their length, the wound is generally on the extremities. If the wound is on the foot, apply the tourniquet about the knee; if on the hand, apply it below the elbow. As these wounds usually occur in the field or woods, you will not have

the necessary appliances, you will have to provide a tourniquet on the spur of the moment; take a handkerchief or grape vine, put it around the limb and twist it tight with a stick. As soon as this is done make an effort to withdraw the poison, split open the part with a scalpel and let it bleed, then with a cupping glass or by sucking (be sure you have no crack or fissure on your lips) remove the poison. If you are near a house, use a tumbler as a cupping glass. Now thoroughly disinfect the wound, using the hot iron, nitrate of silver or a strong bi-chloride solution. The constitutional treatment is important, and for this purpose whiskey is "*par excellence*," but remember it is not a chemical antidote, but only a heart stimulant, and only give it to its stimulating extent. As many people have been killed by whiskey given in excessive quantities as by the snake poison. After the pulse and respirations improve you will wonder what to do with the tourniquet, you can't leave it on, as it will produce gangrene, and you can't take it off, for you know there is still enough poison in the limb to immediately kill the patient if it is allowed to get in the circulation. You can't remove the poison, so the only thing to do is to give it to him in broken doses. Take the tourniquet off for a half a minute, reapply it, stimulate the patient with whiskey and digitalis until the pulse again regains itself, repeat the operation and keep on doing so until the patient is out of danger and all the poison has been introduced into the system.

NOTE.—At the springs three years ago there was a young naturalist. He was making at that time a special study of reptiles. He bought the snakes from the mountaineers and with a scalpel he dissected them. The scalpel usually lay upon his desk, posing as a piece of ornament to his room. While at the springs he fell in love with a beautiful girl, whose name was "Carrie." One day, while revelling in the enchanting dreams of this fair one, he carelessly picked up his scalpel and began to trace her name upon his arm. As he dreamed of his love, ardently and passionately, he traced and retraced the letters of her name until they stood out bathed in his own blood. Suddenly pain and swelling peculiar to snake bite developed, and in great haste I was called in to see him. When I arrived he had all the symptoms of a snake bite, but said he had not been bitten, but had been scratching on his arm

with the scalpel which he used for his dissections. The first thing obtainable was a solution of Nitrate of Silver, and I applied it to his arm. The letters "Carrie" came out in bold black letters, diagnosing for me his trouble, both as to the snake poison and his girl. A tourniquet was applied, and after a vigorous fight the young man recovered.

LECTURE XXVIII.

SPECIAL WOUNDS.—Continued.

Contusions and Bruises.—A bruise or contusion is a subcutaneous wound inflicted by the sudden impact of a blunt body against the skin. They vary in degree and intensity from a pinch or black eye to the pulpification of a limb, such as occur in railroad accidents.

Pathology.—There is a breach of continuity of the subcutaneous tissue, without injury to the skin or mucous membrane covering it. Blood vessels and muscles may be ruptured, tissue and fascia divided, but the wound is protected from external influences by the unbroken skin or mucous membrane.

Symptoms.—The symptoms come on immediately. There is always more or less shock, being symptomatic in the case of a pinch, but real in more severe cases; it may be transitory or may last a long time, even causing death. Pain is not immediately felt, the impact of the blunt body obtunds the nerves, but it finally comes on and increases until agony is endured. It will subside in about an hour, unless hemorrhage is severe or the wound is infected, when it will be severe and lasting. Swelling is always an accompaniment, due to the escape of plasma into the tissues; it varies in amount not only in accordance to the size of the vessel injured, but as to whether the adjacent tissue is loose, when it will be great and when tight it will not be much. Discoloration invariably follows, due to the escape of blood into the tissue, and the disintegration

of the corpuscles, causing the tissues to be pigmented. The tissues are first black, then a greenish yellow; the part finally returning to its normal color. The exact chemical change which causes these various colors is not known. Loss of function always follow these wounds; if it is the hand, its function will be impaired; if the eye, the sight will be impaired, etc.

Diagnosis.—The diagnosis is based on the history and symptoms. Discoloration is the most important diagnostic symptom, as it shows that a blood vessel has been ruptured.

Prognosis.—The prognosis depends on the nature and the location of the wound. Some bruises are so trivial as to pass unnoticed, while others are so severe that death soon elapses.

Treatment.—*General.*—The first thing to do is to combat shock, using the remedies of which you are familiar. Relieve the pain with morphia if it is severe, or if not use some of the coal tar products, such as Antikamnia or Phenacetine. *Local.*—To hasten healing carry out this treatment. Give the part rest, if it be a hand, put it in a sling; if a leg, place the patient in bed and elevate the limb; elevation is important, for in bruises there is concealed hemorrhage going on and by this treatment you lessen pain and prevent such an influx of blood to the part by gravity. Compression is indicated, but must be applied logically. It does good by checking hemorrhage, checks excessive transudation and promotes resolution and restoration of the part to its normal condition. To get compression, a pad of cotton and a roller bandage is all that is necessary. From the operations you have witnessed, you no doubt think that cotton is used extravagantly, but not so, we apply it not only as an absorbent and protector, but also to obtain pressure; it is elastic, resilient and the simplest and most convenient way to get compression. If, however, you feel that the cotton is not sufficient, use a flannel or rubber bandage. With the rubber bandage you can get any amount of compression you desire. If you haven't the rubber bandage or wish the bandage to remain for a long time with access of air to the part, get a piece of flannel and cut it bias (if you tear it you loose the effect of its elasticty), and apply it with steady, uniform tension. Heat and cold is useful if applied logically. Cold is useful when you have a hot, inflamed, painful wound, but in using it you run the risk of so de-

vitilizing the tissue that gangrene may result. If the wound is not very extensive apply ice bags or ice water, but never allow ice to come in contact with the skin. If the above modes are too severe, use evaporating lotions, such as camphor, witch hazel and arnica; these remedies, although the old woman's stand-by in bruises, only do good by their rapid evaporation, due to their containing about 90 per cent. of alcohol, their other uses are "*nil.*" If you have to write a prescription, order alcohol and color it with some bland drug. Heat is useful, but remember when using cold or heat that their affect is about the same, and don't go to either extreme. Heat is useful when the injury is severe and gangrene is feared. You can use either dry or moist heat. A salt bag is a good way to obtain dry heat, make a salt bag, put in a pot and heat it and apply to the part, or you use hot water bags, and if the weight from this is too severe, apply hot flannels. Moist heat can be obtained by the douch, using water as hot as can be borne; place the part over a tub and pour the water over it, or you can use hot antiseptic fomentations applied with a flannel or carbolized cotton. A hot poultice is also valuable. Massage is also very valuable. It is accomplished by delicately manipulating the thumb on the bruised area. It stimulates the blood flow, and favors resolution by breaking up the blood clots.

Burns and Scalds. —A burn is an injury inflicted by dry heat. A scald is an injury inflicted by moist heat. Burns and scalds are identical in their pathology and treatment and will therefore be considered together. Most authors classify these injuries into fifteen varieties, but I will only describe three—burns of the first, second and third degree. Those of the first degree only involves the superficial layers of the skin; in the second degree, not only is the epiderma involved, but it penetrates into the rete mucosum and involves the corium. Burns of the third degree are still deeper and more destructive than the former; it destroys the skin and involves the subcutaneous tissue, muscles and fascia and even the bones may be carbonized.

Cause.—The cause is the application of intense dry or moist heat to the tissues. The degree of the burn depends on the temperature of the heat applied and the duration the tissues are subjected to it.

Pathology.—This consists in the destruction of tissue by coagulation of the albumen of the cells, followed by necrosis or gangrene. The coagulation may not only be confined to the cell albumen, but may coagulate the albumen of the blood in the vessels.

Symptoms.—Pain is sharp and excruciating from the first. The amount and character depends on the depth and extent of the burn; that is a burn of the first degree, is much more painful than a burn of the third degree, this is because the nerves in burns of the first degree are simply exposed and irritated, whereas in burns of the third degree the nerves are destroyed. Redness follows quickly and is more prominent at the margins of the burn; this is due to the inhibition of the vaso-constrictor nerves and consequent congestion of the blood vessels. Swelling quickly follow burns, and is due to the alteration of the capillary walls, causing increased porosity by enlargement of the stigmata and stomata, and thus the escape of fluid is rendered easy. The amount of swelling depends whether the tissue injured is loose or tight. Vesication or formation of blebs, due to the separation of the layers of skin and the accumulation of serum, is always seen in burns of the first degree, rarely in those of the second degree and never in burns of the third degree. Eschar formation, this consists of the destruction of a large mass of cells, which die and are separated from the adjacent tissue. The eschar is sometimes black and again may be yellow or white. The eschar may fall off dry, but if it becomes infected and pulpified it will slough off. To summarize: Burns of the first degree are characterized by hyperaemia of the skin, only the epiderma is involved, there is erythema and blebs or blisters form. Burns of the second degree are characterized by the burn, not only involving the epiderma, but also the deeper layers of the skin, and there may be the formation of blebs and blisters. Burns of the third degree are characterized by eschar formation and by involving the deeper structures as muscles, etc. There is usually shock, which in bad burns may be followed by prostration, delirium and death. If the patient escapes without shock, he is still not out of danger for ten days, for about the third day, congestion of some of the internal organs may occur, due to reflex action, and jeopardize the patient's life. And even ten days after the burn there is danger of ulceration of the duodenum, which shows itself as a bloody

diarrhœa, followed by peritonitis. The pathology of this ulcer is obscure; it is thought to be due to pieces of the scorched blood vessels being carried to the duodeum, causing irritation and ulceration.

Diagnosis.—The diagnosis is based on the history and symptoms.

Prognosis.—The prognosis is based on the depth and extent of the burn, and on the age of the patient (old and young people stand burns badly). The depth of the wound doesn't make much difference as the extent of surface involved, as a person may have a leg or arm burnt off and recover, but if the same person was burned over two-thirds of his body, he would surely die. The reason why people die who are burnt over two-thirds of their body, is due either to increased conduction of heat from the body, stoppage of the excretion of CO_2 by the skin or to the stoppage of the absorption of O by the skin. The first theory is more generally accepted.

Treatment.—The general treatment consist of relieving pain and combating shock, the remedies for each you are familiar with. The local treatment practiced by the laity and some physicians is a shame and a crime, a lasting disgrace to civilization. Well do I remember, while a boy visiting in the country, when a playmate of mine was burnt by powder; he was smeared with soot, molasses and grease, and his head stuck in a flour barrel. These remedies are used because they stop the pain by excluding the air from the wound, but this can be accomplished without using these infected, dirty remedies. Never use Carron oil. This filthy mixture has long been in use; its name being derived by its being discovered by a surgeon to a large iron factory in Carron, England, where burns were of daily occurrence. It is true, it stops the pain by excluding the air, but it is one of the best culture medias I know of. Dress the hand so as to exclude air and prevent infection, and the wound will heal under one dressing. Render the part clean, and if necessary to accomplish it, give an anæsthetic. Clip away all fragments of skin, remove all dirt and cloth, wash it in green soap, alcohol and a bi-chloride solution, if the surface is small, but if large use a non-toxic antiseptic as boracic acid, acetate of aluminum, etc., dust with one of the numerous antiseptic powders, of which iodoform is the best, apply a piece of gauze, then a thick

layer of cotton, a fold of oil silk over this and lastly a neat bandage. This dressing can usually stay on until healing occurs. In addition to the above, you must prevent deformity by means of splints after putting the part in its anatomical position. If necessary assist healing by skin grafting.

LECTURE XXIX.

INFLUENCE OF CONSTITUTIONAL CONDITIONS UPON INJURIES.

The subject which we will now discuss is one of great importance, and is generally not included in text-books. It is the subject of considering the general health of a patient, which should influence you in deciding to operate and its influence in the convalescent stage after the operation. Sir James Padgett says that before performing the most trivial operation, you should first consider the danger to your patient and should examine him at least as carefully as you would for life insurance, where only a few thousand dollars are involved, whereas in the former case there is a life at stake. The importance of this subject is aptly illustrated by the common remark often of late noticed in the newspapers in writing up a death notice of a man who has been operated on, it is stated very satirically that the "operation was a success, but the patient died." It is true that some patients do not die from the operation, for that in its technique was a success, but they die from some constitutional condition, some accompanying but unnoticed trouble which crops out and kills the patients after a successful operation. There are, of course, some operations of such necessity that you are justifiable in not considering the patient's health, such as strangulated hernia, progressive gangrene, etc., but there are others, such as decorating surgery, such as removing a deformity or dissecting out a scar, of which little thought is given, and just such operations are sometimes attended by serious consequences, all from the lack of considering the patient's general health before

operating. So before operating the following conditions should be looked into:

Age.—Children under five years of age stand surgery badly. This statement is the conclusion of many surgeons of long experience. They stand shock badly, have little resisting power to loss of blood, can't be kept quiet and stand anæsthesia badly. So avoid operating on a child if possible. A person between five and fifteen is the best patient a surgeon can have. They stand shock well, their organs are in good working order and free from functional diseases, their mind is in a tranquil state, being not worried about business or the future. From fifteen to forty the danger increases, and from forty to seventy it rapidly increases, as the patients are depressed, anxious in regard to the future, their organs are diseased, and everything looks gloomy. Old people may be divided, however, into four classes. The first class are those who are fat, pale and flabby, they are lazy and indolent, with a weak pulse; this class is a poor one for surgery and can't stand much operative interferences. The second class are those who are fat, hardy and vigorous. They sleep well, eat hardily and take plenty of exercise, they are ruddy, strong and healthy; these people are better by far for surgical work than the first class. The third class are those who are dried up, wiry, tough, vigorous and are active busybodies; these take surgery best of any class of old people. The fourth class are those who are dried up, shriveled, becrippled "en toto," who have a weak pulse, a bad digestion and are anemic; this is the worst class of all for surgery. In operating on an old person, do as little cutting as possible, guard against loss of blood and shock, keep him warm and, above all, do not feed him too much, they can't stand as much food as the young.

Sex.—As a general rule women stand surgery better than men. This is because women are not as liable to constitutional diseases as men, such as syphilis; they do not indulge so much in alcoholic drinks and are not so restless, they are used to being housed up. Never operate on women during the menstrual period, unless actually necessary, for from some unaccountable cause there will be fever and irritability. Never operate on pregnant women, unless there is a large ovarian tumor or a hernia, for fear of the complication of abortion. It is also best not to operate during lactation,

although the patients usually do well. Under no circumstances must you operate on the mamma during lactation, as hemorrhage will be severe, hard to stop and sinuses will be opened up through which milk will escape and thus retard healing.

Vigor and Weakness.—It is not the strong, robust man that makes the best patient. They may look ruddy and say they have the constitution of an ox, but their convalescence is not as satisfactory as the pale, weak patient. This is because a man used to hard work, gross food and outdoor life, when operated on, the change of life, dread of the future and shock often kills him. While a pale, weak man, who has been lying in the hospital for months and looks on the operation as the only means of saving his life, will do well and make a speedy recovery.

Obesity and Plethora.—Obesity is a bad complication. Sometimes a fat man will make a good patient, provided he is young and the fat is hereditary. But when seen in a man over forty, it is due to laziness and he will be a hard patient to manage. He is an elephant on your hands, can't be shifted on the bed, can't be kept clean and bed sores will form. When an incision is made through the skin of a fat man, it will be found thin from pressure; you can't approximate the wound, you can't get compression and the fatty tissue is liable to break down and become necrotic. Plethora is not a contraindication to surgery. They generally do well, unless the plethora be from organic disease. Do not get a plethoric individual mixed with a man like a beer wagon driver or an inn keeper, whose full bloodedness is due to organic disease caused by alcohol; these people are horrible subjects.

Alcoholism.—A patient addicted to alcohol is the worse subject a surgeon has to deal with; there can be no complication as bad. Never operate on a habitual drunkard, unless actually necessary, as for appendicitis or hernia. The operation on such subjects is usually followed by delirium tremens and results fatally. Opium is almost as great a barrier to surgery as alcohol. They are in the habit of quieting their nerves by opium, and after the operation are compelled to have it and in larger doses. It locks up the bowels and does great harm, especially after laparotomies.

Tuberculosis.—Tubercular patients, unless the disease has attacked the lungs or liver, do well after an operation. Tuberculo-

sis of a bone or gland does not indicate adversely in deciding to operate; they stand the operating well, but the recovery is slow. If you do not remove every particle of tubercular matter, the disease will return before the wound heals. You can't count on a cure until three months has elapsed. The operation has to be frequently performed over. When the disease has attacked the lungs or liver, you must give the case serious consideration before operating, for in the case of the lungs, the anæsthetic adds to the trouble, and pneumonia may follow the operation. In the case of the liver or bowels, serious complications may arise, so do not operate unless the life of the patient depends on it. One-fourth of the phthisical patients suffer from "fistula in ano;" they cough up the sputum, it goes down the throat, through the alimentary canal and produces a fistula. If a man comes to you pale, emaciated, having fever and debilitating sweats and tells you the consumption is bad enough and asks you to relieve him of the pain of the fistula, I believe it is your duty to operate; at the best he can't live long, and you are justifiable in making him comfortable for this short while, even at the risk of his immediate death. In performing this operation do it quickly, give the anæsthetic to its minimum extent, split open the fistula, irrigate and pack with gauze.

Syphilis.—It is commonly thought that syphilis prevents a wound from healing, but my experience, having operated time and time again in the acute stage, teaches me that this is not so, the wounds heal well. It is not a very agreeable job, for there is danger of the surgeon contracting the disease, but the wound made heals kindly, and as far as the patient is concerned he is not worsted, but many surgeons to-day are suffering from syphilis contracted while operating on syphilitic patients.

Rheumatism and Gout.—Neither of these diseases retard the healing of wounds. A man suffering from either makes a good subject, but it is best not to add the pain of an operation to the pain of an acute attack of rheumatism, you should postpone the operation if possible. Often when there is a tendency to these diseases, an operation will precipitate an attack, so don't be surprised when this happens.

Cancer.—A patient suffering from a cancer makes a good subject; the wound heals readily. Cancer is not inoculable, so there is no danger from cutting yourself while operating.

Anemia.—This condition should be corrected if possible before operating, by the administration of tonics, iron, etc. If the anemia is due to hemorrhage, as from a fibroid tumor or menorrhagia, don't wait for medicines. In the case of the tumor remove it at once.

Leucocythemia.—This disease absolutely prohibits any surgical interference. Out of one hundred cases where Splenectomy was performed for this disease, all died.

Hemophilia.—This is a constitutional disease, characterized by the individual bleeding enormously from trivial injuries. Never operate on these individuals if possible to avoid it. Sometimes they will fool you; they may have bled profusely on several occasions, and their ancestors have died from the disease; yet when operated on they do well and bleed very little.

Malaria.—This disease has a curious influence upon results. Not only does malaria influence the wound, but the wound influences malaria. A patient suffering from chills and fever is made much worse by an operation; or if a patient had chills and fever fifteen years before, on operating upon him, the chills and fever will return and in much more serious form. A man may have lived in a malarial district, but never was affected with the disease, or may have lived elsewhere for years, but when operated on it will break out, the germs having been lurking in his system ever since he lived in the malarial district. There is often periodical trouble from a wound due to malaria; the wound will bleed every other day, reddens every other day and suppurates every fourth, seventh or twenty-first day. Give quinine and these symptoms will disappear.

Acute Diseases.—Never operate during acute disease, such as the Lagrippe, scarlet fever, mumps, chicken pox, etc., unless actually necessary to save life.

Affections of the Nervous System.—There are certain types of individuals who comes to the doctors office that he can size up, he has a nervous tremor, timid and effiminate; he discusses the operation with terror and horror. Don't think he will make a bad subject, after the operation he makes the bravest and most hopeful patient and soon recovers. The worst patients are the morose and sullen; no matter what encouragement you give them, and bright accounts of the operation, she will sigh and say, "I am ready to

go when the Lord calls me." Get the confidence of your patients, never attend a case over twice without having gained some influence over the patient; if you can't do it by winning their affections, make them afraid of you. Insane people make good subjects, unless they are dirty in their habits and uncontrollable. A patient who has been to an asylum, kept clean, had good food and deprived of alcohol, makes a splendid subject for operative measures.

Diabetes.—This is a disease characterized by sugar in the urine. How or why it is there we do not know; some observers claim it is caused by irritation of the medulla, others say it is due to disease of the liver. However this may be, we do know that a wound made on a patient suffering from the disease will not heal, but is liable to slough or become gangrenous. Examine the urine every time before operating, and if sugar is found, don't operate, unless the urgency is so great that the risk is justifiable.

Visceral Diseases.—Every patient that comes to you will have a weak heart and can't take chloroform. They all have a "Locus Minoris Resistentiæ" in their chest. It is the people who know there is nothing the matter with their heart who die from chloroform anæsthesia. I have used anæsthetics in patients with almost every disease of the heart without ill effect. Patients who are supposed to be diseased to such a degree as to contraindicate chloroform stood it well and the wound heals readily. In phlebitis, artheromatous or calcareous degeneration of the vessels, the result is markedly influenced; there is always danger of secondary hemorrhage and the flaps may become gangrenous from improper nutrition. In diseases of the respiratory tract, such as bronchitis or pneumonia, chloroform should be carefully given if at all. Diseases of the stomach and alimentary canal often complicate results, the patient will be unable to assimulate food, and convalescence will be retarded. Constipation also influences results. Some diseases of the liver is a bad complication, such as torpor, cirrhosis, fatty and lardaceous degeneration. Diseases of the kidney, such as Bright's disease and surgical kidney, is a positive barrier against surgery, other than pressing operations to save life. Albumen in the urine is a barrier, the wound will heal well, but the patient will die from uremic poison.

LECTURE XXX.

ANTHRAX—HYDROPHOBIA.

Anthrax, Malignant Pustules, or Wool Sorters Disease, is an acute, infectious disease, due to the inoculation of a specific microbe. It is characterized by local inflammation and afterwards by general infection of the whole body, and usually results in death. This disease is particularly interesting, because of its being the first disease to be proven to be of microbic origin. Pollender, in 1849, with the crude instruments then is use, proved it to be due to a microbe and named it the Bacillus Anthracis. It is the largest pathogenic germ known, being from five to ten microns in length and from one to one and a quarter microns in diameter. It is a rod-shaped germ, extremely hardy, grows at ordinary temperatures, but grows best at the temperature of the body. It grows in most all the medias, can be stained easily by aniline dyes, multiplies in the living body by direct segmentation, and when cultivated in the laboratory it multiplies by spore formation. Anthrax never occurs spontaneously in man, but occurs primarily in the lower animals and from them are communicated to man. The bacillus is found in low, swampy places in warm countries, and is transmitted to animals by grazing the grass on these swamps. It usually attacks herbivora, less so the omnivora and never attacks the carnivora. The germ locates in the lips, mouth or stomach, produces the disease and usually kills. The disease is transmitted to man by handling the hides or meat of these animals. It is usually seen in tanners, butchers and wool sorters. Anthrax may be internal or external. Internal anthrax is contracted through the respiratory or alimentary tract and belongs to the physician to treat. External anthrax is contracted through the skin and belongs to the surgeon, this form we will now discuss. External anthrax is due to infection through the skin, and as the unbroken skin acts as a barrier against infection, there must be an "*infection atrium*," as in wool sorters a hang nail is sufficient to allow the entrance of the germ. After penetrating the skin and reaching the

deeper tissues, the germ may produce either an anthrax carbuncle or anthrax œdema, which depends on the character of the tissue reached. If the tissues are firm, dense and vascular a carbuncle will result. If the tissues are loose and poorly supplied with blood, anthrax œdema will result. The pathology of both carbuncle and œdema are the same, if it attacks the face anthrax carbuncle will result; if it attacks the forearm or back, anthrax œdema will result.

Symptoms.—The symptoms of anthrax carbuncle usually comes on in from six to twenty-four hours after inoculation. There is local tingling, burning, itching and redness, with the formation of a blister, which is filled with serum, it soon becomes black and bursts, exposing a small spot of devitilized tissue, which continues to grow, and in a few hours is as large as a dollar. This is surrounded by a hard, inflammatory base. The disease gradually extends into the neighboring tissue, and septic phlebitis or lymphangitis may result. The pulse is rapid, skin cold and clammy and there are general symptoms of septic intoxication. The symptoms in anthrax œdema are not so well marked or so easily differentiated from other troubles. There is localized tingling, smarting and redness, the swelling and œdema then rapidly spreads in all directions. The tissues are infiltrated with bloody serum and death usually results.

Diagnosis.—The diagnosis is based on the history, the fact of working in a tannery or as a butcher or a wool sorter. The microscope gives a positive diagnosis. The disease can be differentiated from the ordinary carbuncle, by the fact that an ordinary suppurating carbuncle is nothing but a mass of furuncles and each discharges from a separate opening, whereas in anthrax carbuncle there is a single opening, and it has a characteristic gangrenous scar beneath.

Prognosis.—The prognosis is very grave. It is based on the location, character of the trouble and on the constitution of the patient. The carbuncular variety gives a better prognosis than the œdematous variety.

Treatment.—The local treatment is the most important. Parenchymatous injections of carbolic acid is recommended, thoroughly saturate the tissues, using a 5 or 10 per cent. solution. Introduce

the needle about a quarter of an inch from the diseased tissue and make numerous punctures all around the wound. If there is no improvement in six hours, repeat the operation. Guard against poisoning the patient with the acid. If this treatment does no good, apply a tourniquet, render the part clean and excise the diseased tissue, irrigate with a bi-chloride solution, cauterize the wound and pack with iodoform; dress the wound daily. Remember that death threatens from depression, and give stimulants and good nutritious food.

HYDROPHOBIA, Rabies, Canine Madness or Lyssa are terms used to designate an infectious disease caused by the bite of a rabid animal. The essential cause is not known, several germs have been found associated with the disease, but none of them have been proven to cause the disease. We do know, however, that the poison comes from the salivary glands of animals belonging to the canine tribe, dogs, cats, wolves and foxes.

Hydrophobia in Dogs.—The term hydrophobia, when applied to the disease in dogs, is a misnomer. The word means a dread of water, and a dog suffering from the disease is not afraid of water, but drinks hardily in the first stage and even in the last stages attempts to swallow water when given to him. The old test of placing a bucket of water before the dog and if he refuses to drink, to pronounce him mad, is no good. The proper name is rabies.

Symptoms.—The symptoms are in three stages: First, premonitory; second, irritability; third, paralysis. I do not believe rabies can originate in a dog spontaneously, he must be bitten by a dog or other animal suffering from the disease. After having been bitten, a variable period of incubation elapses, which may be from ten days to six months; the usual period is about four weeks. A dog having been bitten about four weeks before, the wound having perfectly healed, the dog becomes morose and sullen. His whole nature is changed, the former like for his master is changed to dislike, when called to his meals, he refuses to come, sulks behind the house and when caught snaps at you; again, the dog may become more extravagant in his affections, and if you have a sore on your hand you are liable to be inoculated by his licking you; these are the prodromal symptoms. After three or four days the irritative stage comes on. The dog is taken with a desire to roam about, an

irresistible impulse makes him travel. His head and tail is drooped, eyes extremely red, and if another dog crosses his path there will be a fight. He makes no attempt to bite a man when he meets him unless the man trys to stop him. If he is put in a cage he will bite the iron rods in his frenzy. Soon this stage passes off and the stage of paralysis comes on. His hind legs become paralyzed, he is worn out from want of food and from long travel, and curls up in a fence corner and dies. This generally takes place in from four days to two weeks.

Hydrophobia in Man.—Its frequency varies, some sensible and competent observers claim there is no such disease and have offered large rewards for the exhibition of a case; others equally as competent claim there is such a disease, but deny its frequency. Thirty cases have been in the last year reported from the United States and France.

Cause.—The cause is the bite of a rabid animal.

Symptoms.—A man having been bitten by a dog, is in a state of terror for a week or more, but as time defaces the accident he thinks no more about it. In about six weeks, which is the usual period of incubation, although it has been known to be as long as eleven months, the prodromal symptoms appear. There is pain about the old wound, which has healed, but now becomes red and throbbing. He is irritable, cross, depressed, has forebodings of evil and says he is going to die. After a few days more active symptoms develop, there is a constricted feeling about the throat, he is unable to swallow and although suffering from intense thirst he dreads water; if a glass of water is handed him he will attempt to drink it and will be almost thrown into convulsion and will refuse it thereafter. There is oppression about the chest, the respiration is interfered with, not as in tetanus by rigidity of the pectoral muscles, but by spasms, and constriction of the glottis. The most horrible symptom is the terror of the patient, the despair and hopelessness is appalling to the doctor. Nothing you can say gives him any comfort or removes the depression. The temperature runs up to 101-103-106 degrees F., pulse rapid and feeble. Nature is not as merciful in this disease as in others, his brain remains clear to the last and he suffers horribly. Death invariably occurs in from four to seven days from the pain, starvation and depression of the

heart. You have no doubt heard that a man with hydrophobia simulates a dog, it is unfounded, the venom which produces the trouble has no power of changing a man into a dog. The patient does make a noise like the bark of a dog, but it is caused by his efforts to expel mucous from his throat. And the intense pain causes him to throw himself from the bed and roll on the floor.

Diagnosis.—The diagnosis is based on the history. The fact of having been bitten by a dog, and the chracteristic throat symptoms makes the diagnosis clear. It can be differentiated from tetanus by the fact that the jaws are not locked, and from the respirations being interfered with, not as in tetanus by spasms of the pectoral muscles and diaphragm, but by spasms of the glottis.

Prognosis.—The prognosis depends on the stage you see the patient in. If he has just been bitten by heroic treatment there is a chance of recovery, but if the disease has already made its appearance, he will die regardless of treatment.

Treatment.—The prophylactic treatment is the only treatment which gives any hope. Some individuals escape hydrophobia when bitten by rabid animals, this is explained by their being bitten through their clothes, and the virus is wiped off by them, but it is your duty to treat the wound heroically under all circumstances and risk nothing to chance. Apply a tourniquet as quickly as possible, split the wound wide open, either remove the virus by sucking it or with the cupping glass, cauterize the wound, using the actual cautery (never use nitrate of silver, as it does not penetrate deep enough), use the thermo-cautery, a red hot iron or pure nitric acid. After devoting your first attention to the patient, look for the dog. When you find him don't kill him, put him in a cage and wait for developments, he may have worms and will simulate rabies, but will recover in a few days; but if the dog dies with all the symptoms of rabies, send your patient to Pasteur's Institute for treatment by his serum at once. The mode of preparation of this serum has been explained. The success of this treatment is without doubt. If you do not see the patient until the disease has fully developed, don't tell him he has hydrophobia, he has troubles enough of his own, put him in bed and administer morphine and chloroform until death relieves him of his sufferings.

LECTURE XXXI.

GLANDERS—ACTINOMYCOSIS.

Glanders, Farcy or Equinia is a constitutional disease due to the infection of the bacillus mallei. The disease never primarily affects man, but is transmitted to him secondarily from animals.

Cause.—The essential cause is a germ known as the Bacillus Mallei. It is a rod-shaped bacillus, in length about two-thirds the diameter of a red corpuscle and about one-third its diameter in breadth. It is about the size of the bacillus tuberculosis, it is immobile, multiplies by spore formation, grows in most of the common culture medias, develops best at about the temperature of the body, stains readily with aniline dyes and is very resisting to germicides and heat.

Pathology.—A horse, when he acquires glanders, has the appearance of having a bad cold. His temperature per rectum will be from a 108-109 degrees F., he is restless, irritable, coughs, discharges flow from the nose, nostrils are swollen and their mucous membranes are purplish in color. In a short while the mucous membrane becomes spotted with red punctiform points, which increase in size and finally ruptures and pours out a nasty, fetid discharge. If this discharge comes in contact with the broken skin of man, the disease is acquired and usually results fatally. It is more common among grooms, hostlers and jockeys. The disease cannot occur without an "*infection atrium.*"

Symptoms.—When inoculation occurs, say in a hostler, there is a period of incubation varying from two days to six weeks. After this time elapses the prodromal symptoms appear. There is anorexia, nausea, headache and fever, the wound, which has not healed from being contaminated by dirty bandages, is swollen, congested and gangrenous. The bacillus produces a chronic inflammation, which is attended by increased formation of embryonal cells, these become massed together causing pressure, and an ulcer is formed, which progresses rapidly; if it is on the face, its whole surface becomes involved; if on the hand, the bones may even be

attacked. The constitutional symptoms now become worse, there is a severe chill, high fever, prostration, collapse and death. Glanders is sometimes said to be acute or chronic. The acute variety is due to a germ of great virulency acting on tissues of low resisting power and is always fatal. Chronic glanders is due to an attenuated germ or virus acting on tissues of high resisting power, and there is a chance of recovery. The symptoms of both varieties are the same, only differing in intensity.

Diagnosis.—The diagnosis is based on the occupation of the patient, on the symptoms and by examining the secretions under the microscope and finding the bacillus mallei, makes the diagnosis positive. If you are in the country where there is no microscopist, you can make your diagnosis by inoculating an animal with the secretions, when if the disease is glanders, the animal will die in four days with all the symptoms of the disease.

Prognosis.—The prognosis depends on the health, vigor and robustness of the patient, on the character of the attack, whether acute or chronic, on your early diagnosis, your knowledge of the pathology of the disease and on your treatment.

Treatment.—The prophylactic treatment consist in the destruction of the animal infected by burning the body the moment the disease is detected, this is to prevent the disease from attacking other animals. If you bury the dead animal, when the soil is upturned the disease will break out again. Thoroughly disinfect the stable and burn all sponges, bags and buckets used about the diseased horse. When the disease does occur in man, the local treatment of the ulcer is the most important. Treat it as a malignant growth. If the ulcer be small, give an anæsthetic, render the part clean, make your incision an inch from the ulcer and remove it bodily, disinfect the wound with a bi-chloride solution or chloride of Zinc, and if you think advisable, use the thermo-cautery; if you haven't the improved instrument, a red hot iron answers just as well, dust with iodoform gauze and let the wound heal by granulation. Dress daily, and if other ulcers form, treat them in the same manner. If the ulcer is too large for this treatment, thoroughly curette it, cauterize it and dress daily. Combat the constitutional symptoms by administering strychnine, whiskey and plenty of nutritious, easily digested food.

ACTINOMYCOSIS.—Actinomycosis is a contagious disease, due to the infection of the Ray fungus or Actinomyces. The ray fungus is not, strictly speaking, a bacteria, it does not belong to the group of Schizomycetes, but is a fission fungi or Hyphomycetes. It is not microscopic in size, but is large enough to be seen with the naked eye. The fungus or mould resembles a chestnut burr, having a depression in the center, from which radiate fibres which are tipped at the ends with a bulb. It is found wherever rank vegetation grows, along margins of streams where the soil is alkaline, rich and moist, and from here they are transmitted to animals while grazing and from them secondarily to man. The disease is seen in herbivora and omnivora, but never in carnivora. The germs locate in the mouth, throat and stomach of animals, and when located in the mouth constitutes a disease known as "Lumpy jaw." The germ is hard to cultivate, it only grows in sterilized blood serum and doesn't stain with ordinary aniline dyes. Any small portion of it causes the disease. It is transmitted to man by eating the meat of infected animals.

SYMPTOMS.—When the fungus is implanted in the tissues of man, which usually takes place in the mouth, throat, stomach or intestines, it produces a chronic type of inflammation. It is so chronic in type that there is no fever, redness or pain. Swelling is seen, which is due to the proliferation of the fixed tissue cells of the part, and a tumor is formed. This tumor is usually diagnosed as a sarcoma, but the microscope gives the difference. If the tumor becomes infected with the pus germs (which usually happens) it becomes congested, red and painful, the pus will work its way to the surface, point and discharge. After discharging its contents, the condition is not improved, suppuration continues and there is a constant oozing of pus. The patient becomes emaciated, depressed, there is fever, night sweats, diarrhœa, etc. Amyloid degeneration of the internal organs frequently occurs.

DIAGNOSIS.—The diagnosis is based almost entirely on the microscope. It is much harder to diagnose after infection by the pus germ, it being taken for either a tubercular or a syphilitic abscess, but the pus from actinomycosis contains yellow bodies, which can be mashed between the finger, and when examined under the microscope shows the ray fungus.

Prognosis.—The prognosis is about the same as that for a malignant tumor as Carcinoma or Sarcoma. If the tumor is accessible to surgery, the prognosis is good, if not the patient will die.

Treatment.—The local treatment depends on the stage of the disease. If you can remove it before the infection by the pus germ, it will not return; but if suppuration has taken place, and the surrounding tissues are involved, the operation is much less certain to give relief. Split open the part with a long, free incision, gouge out the infected tissue with your finger or curette, cauterize the surface with a 10 per cent. solution of chloride of Zinz, or the actual cautery, pack with gauze and dress daily. Usually there will be a small piece of infected tissue left, and the disease will return, operate as before, and repeat the operation every time the disease reappears. Combat constitutional symptoms with whiskey, strychnia nitrate, and good nutritious, easily digested food.

LECTURE XXXII.

TUBERCULOSIS.

Tuberculosis is a chronic inflammation, caused by a specific germ and characterized by the formation of nodules or tubercles. This disease has long occupied the attention of the scientific world. As far back as 1826 Laennec advocated that it was due to a virus and was contagious. Up to this time the disease was thought to be hereditary or miasmatic. In 1865 Vellemin took up the work of Laennec and tried to demonstrate it from personal interest, but during his investigations he was inoculated accidentally and finally died of Phthisis; but during his life he demonstrated conclusively that tuberculosis could be transmitted by inoculation. He took a lung from a patient dead of tuberculosis and injected one of the cheesy masses into a rabbit, in six weeks the rabbit died of tubercular peritonitis, he made a solution from this rabbit and injected it

into another, causing a tubercular abscess. The next investigator was Cohnhein, in 1877. He said it was pretty theory to inoculate a rabbit and find the tubercles after death; he wanted to watch the process during life, and he did it in this way. He made a small slit in the iris of a rabbit, implanted a small piece of tubercular tissue, and watched its effect. In one or two days the incision had healed, and the foreign mass could be seen through the transparent cornea. Soon chronic inflammation followed and in two weeks, he could see numberless miliary tubercles in the iris. In spite of these researches nothing further was done until 1882, when Robert Koch, the father of modern bacteriology, published a paper which revolutionized the field of surgery. He had discovered the essential cause of the disease, which is a bacillus which bears his name, "Bacillus of Koch." He did more than discover the germ of the disease, as up to this time the disease was thought to be confined to the lungs, but he proved that it was tuberculosis and not scrofula which attacked bones, skin, glands and various other tissues of the body. This paper brought conviction to the most skeptical. In it he laid now his four laws in regard to a germ being the cause of a disease, which have already been enumerated in a previous lecture. He proved by these laws that this bacillus was the cause of tuberculosis; the bacilli was invariably found in the tubercles, they could be bred from the tubercles, and would cause the disease in a healthy animal when inoculated into him, and when this animal died the same germ was found in his tissues.

The term scrofula is a misnomer, it is a relic of ignorance, a barbarious cloak to cover ignorance of the pathology of the lesion. It was formerly used to designate diseases of glands, bone, peritoneum, etc., but the term has been erased from all modern literature. All scrofulous troubles are tubercular troubles, no matter where the disease is situated, in glands, bones, belly or joints. Out of a hundred cases of so-called scrofula examined by Koch, he found the tubercle bacillus, which he bred and with them produced tuberculosis in other animals. When speaking of tuberculosis, naturally from contact with the laity, you mean tuberculosis of lung tissue, this you should avoid. It is true the lungs are more frequently the seat of the disease, but it also attacks the brain, skin,

rectum, liver, bladder, etc. The importance of this dread disease can't be overestimated. Fifty per cent. of all human ailments are of tubercular origin, and it is said that one-seventh of the world's population die of the disease.

Inoculating Experiments.—You can take any animal and inoculate him with the bacillus of Koch and produce the disease. Some animals are more susceptible to the disease than others, the rabbit, hedge hog, mouse, etc., are more liable to the disease than the horse or goat. The dog and cat, although so common, are not employed, as the disease in them is not so well marked. You can use for inoculating experiments the sputum, lung tissue or an emulsion from tubercular glands. You can either triturate the material in a mortar and inject it into the animal or make an aseptic incision in the animal and plant a piece of diseased tissue, afterwards suturing the wound. In about ten days after the inoculation, the symptoms develop, fever, anorexia, weakness, exhaustion and rapid death. The fever is a hectic variety, which is characteristic of tuberculosis, it comes on in the evening and abates in the morning. After death, on dissecting the animal, you will find tubercles all over the organs and can from this animal's tissues reproduce the disease in other animals.

Inoculating experiments on man, owing to the laws, can't be done, though sometimes in the future, laws will be passed allowing the use of criminals for this purpose. Accidental inoculations have occured, and upon these we must base our observations. A robust, healthy house girl, while cleaning the room of a phthisical patient, accidentally fell while carrying out the spittoon, and a cut was inflicted on her hand. In three weeks tubercles formed, in six weeks the glands became involved, and in them the characteristic bacilli were found. Another case is on record where a man, while m[illegible]ving, cut his knee, he went to the branch and was washing it, when a friend passed by and loaned him his handkerchief to bind up the wound. The friend was tubercular, the man was inoculated and died of tuberculosis in less than a year. The disease has been transmitted by wearing earrings of tubercular patients. Lastly, it is of historic record that an old Jewish Rabbi inoculated twelve children in following the old Mosaic laws of circumcision. The custom was to stop the bleeding by the Rabbi spitting wine on the

bleeding prepuce, which acted as a styptic. The old Rabbi had tuberculosis, the children were inoculated, several died from the disease, a fate no less desirable than the loss of the organ as the rest did.

CAUSES.—*Predisposing.*—It is well known that consumption runs in families. This is not only the idea with the laity, but life insurance companies refuse all risks in consumptive families. How can this be accounted for? That the grandfather, the greatuncle, the father, the father's brother, the aunt and the sister all died from tuberculosis. One set of observers claim that it is the direct transplantation of the germ from the mother or father to the offspring during conception. That a man with tuberculosis has the germ in his semen; that a woman with tuberculosis has it in her ovum. That the germ may lay dormant during the growth of the child and develop years afterwards. They claim that the bacillus from a tubercular woman can penetrate the placenta, nature's filter, and inoculate the child. They have reasons for this conviction, for they have taken a tubercular mother and after scrupulously observing the laws of asepticity, delivered her of a dead baby, immediately it was cut open and it was found to be tubercular. On the other hand, their opponents have taken a pregnant guinea pig and inoculated her with tuberculosis and her offsprings showed no signs of the disease. It does not seem probable that the germ can lay dormant for so long a time and then suddenly produce the disease. Other observers claim that the germs cannot be transmitted from mother or father to offspring, but a child from tubercular parents has a certain weakness or a hereditary predisposition to the disease, and if he comes in contact with the germ in after years he contracts the disease.

Still there are a third set of scientists who claim that the above theories are all bosh. That a man has either got tuberculosis or he hasn't got it. The reason why consumption runs in families is because the children have the predisposition to the disease from being born of consumptive parents, they are then raised up with the germs surrounding them, having consumptive people to live with, eat with, sleep with, play with, they crawl on the floor, spat on by consumptives and often nurse consumptive mothers. If these children were not put in such surroundings, or were isolated from

consumptives from the time of birth, they would not have tuberculosis. A case is on record of an old lady whose son went West and located in a town where there was a Sanitarium for tubercular patients. He contracted the disease, came home and was nursed by his mother. Three weeks after his death the mother died of tuberculosis, transmitted to her predisposed tissues by her son.

Essential.—The disease cannot develop without infection by the bacillus of Koch. This is, with the exception of the germ of septicemia in mice, the smallest pathogenic germ known, in length it is only one-half the diameter of a red blood corpuscle, it has round ends, slightly curved and may be found singly or in bunches. It multiplies by spore formation, is very hardy, resisting heat and germicides markedly, it is difficult to cultivate, not growing in any of the common media, but grows in sterilized blood serum and agar agar after the addition of glycerine. It is characterized by not staining with the ordinary dyes; it has to be stained with a combination of dyes, which must be alkaline in reaction. When stained, unlike other germs, it cannot be bleached by either sulphuric or nitric acid. This makes them easily recognized. The germ may enter through the respiratory, disgestive, genito-urinary tract or skin. A phthisical patient will spit on the floor, the sputum becomes dry and is scattered over the room and is taken into the lungs; if the lungs are healthy there is no danger, but if there is bronchitis or the lung tissue is in a lowered state of vitality the disease will be contracted. Milk from a tubercular cow or meat from a tubercular animal may cause the disease, and it is only because of the acidity of the stomach that we are protected, but people with a bad digestion or those who have been taking bicarbonate of soda, thus rendering the secretions of the stomach at the time alkaline, are extremely liable to contract the disease from tubercular meat or milk. The disease may be contracted by having connection with a tubercualr woman. The unbroken skin acts as a barrier against infection, but surgeons and butchers in their daily work are often inoculated by cutting themselves.

LECTURE XXXIII.

TUBERCULOSIS—Continued.

Tubercle.—A tubercle is as much the specific lesion of tuberculosis as a chancre is of syphilis. It is the result of chronic inflammation. It is a small grayish nodule, due to an aggregation of cells and characterized by the fact that it contains no blood vessels.

Histological Structure.—A tubercle is composed of epithelioid cells, giant cells, leucocytes, bacilli and a reticulum. The epithelioid cells are round or oval, twice as large as a white blood corpuscle, composed of fine granular protoplasm, with two or three nuclei. They are in large numbers, making up the major portion of the tubercle. Their origin is a disputed question. They are the result of the proliferation of the fixed cells of the part, the chronic inflammation stimulates them to proliferating and these cells are formed. The giant cells are a hundred times as large as a white corpuscle, made up of fine granular protoplasm, with from fifteen to twenty nuclei, which are not arranged in the center, but around the periphery of the cell in the shape of a crescent or half moon. Their origin is also a disputed question, but they are nothing but overgrown epithelioid or embryonal cells, which have sprung from the fixed tissue cells, but instead of multiplying and dividing it apropriates its nutriment towards its own growth. The leucocytes are the ordinary white blood corpuscles; their origin is from the neighboring blood vessels, the chronic inflammation having caused increased porosity of the blood vessels, their escape is made easy. The bacilli of Koch is also found in the tubercle, a description of which is given in the preceding lecture. The tubercle is held together by a delicate framework of connective tissue. This is not a newly formed tissue, but is the old connective tissue of the part, simply pushed apart by the growth of the cells. The arrangement of the above elements in a tubercle is into three strata. When examined under the microscope the following arrangement will be noticed from the center outward. We first have

in the center the giant cells, two or three in number, around these are the epithelioid cells and next comes the layer of leucocytes; binding this mass together is seen the reticulum and scattered throughout the tubercle will be seen the bacilli, which are usually more numerous in the middle layer or epithelioid cells and some may be seen perforating the giant cells. The tubercle contains no blood vessels and therefore has to obtain its nutrition by absorption and percolation.

Development.—Essential for the development of a tubercle is the implantation of the bacilli of Koch in the tissues. When implanted they multiply and produce their characteristic toxins, which acting on the tissues, sets up a chronic low grade of inflammation. This inflammation causes the vessels in the neighborhood to become more porous and leucocytes escape and wander to the infected point. The fixed cells are now stimulated to proliferate, and epithelioid cells are formed containing one or two nuclei, they form slowly at first, but soon the process rapidly increases and a considerable bulb of them are formed. Some of these cells will not divide and multiply like the rest, but grows very large and forms giant cells with from fifteen to twenty nuclei. The connective tissue is being pushed asunder as the cells are formed, and thus the reticulum is formed. Now we have a tubercle with bacilli studded all through it. It is at first microscopic in size, but soon becomes as large as a millet seed, when it can be seen with the naked eye, and appears grayish. Other tubercles now form, increase in size and two or three may coalesce. Gradually the whole of the surrounding tissue is attacked and becomes a solid tubercular mass.

Caseous Degeneration.—The tubercle, being poorly nourished, dies, the centre first, this point being the longest deprived of nutrition, also the longest exposed to the action of the bacilli and their toxins. We have coagulating necrosis, the mass becomes a yellow, cheesy looking substance and hence the name caseous degeneration. Owing to the fact that some of the tubercles are yellow and others grayish, we speak of gray or miliary tubercles and yellow or caseous tubercles.

Symptoms.—When you remember that tuberculosis may attack almost any portion of the body, you can readily see that, although

the local symptoms in each locality resemble each other, still there is a difference, and for this reason the local symptoms will be given under each respective head. The general symptoms due to the absorption into the system, the toxins of the specific germ are as follows: Hectic fever, which is pathognomonic of tuberculosis, is always present. There is exhiliration when it is at its height and profound depression when absent. It is highest in the evening and falls by morning. There is a gradual failing of strength, emaciation, anorexia, night sweats, prostration, diarrhœa, collapse and death.

Diagnosis.—The diagnosis is based on the history. If you believe in heredity, search his family history, see if he was born of tubercular parents and raised in tubercular society. Secondly, the diagnosis is based on the symptoms, not so much on the local as the general symptoms, such as hectic fever, emaciation, etc. When the diagnosis is doubtful an infallible test is the microscope or inoculation. Send some of the sputum if the disease is situated in the lungs, clip off a piece of the skin, if it is situated on the skin, or if it is in a bone send some of the exuded tubercular material to a microscopist for examination. Send it in a well corked bottle of either alcohol or chloral hydrate. Inoculation is a still more reliable test, and can be done where you haven't the facilities for microscopic examination. Introduce some of the suspected material into a guinea pig or rabbit, kill it in ten days, and if the patient is suffering from tuberculosis, the animal will show the characteristic tubercles. This is really a more reliable test than the microscope, and the only differential test to tell a tubercular nodule from a syphilitic nodule.

Prognosis.—The prognosis is based on the age, general health, extent to which the disease has progressed and to its accessibility to surgical interferences; thus the prognosis is better in a young, robust man than in an old man, without vitality and with a poor digestion; it is also better if it occupies only a small area and is situated on the skin, where it can be radically removed than if located in the liver or lung.

Treatment.—The local treatment consist in the radical and complete removal of the infected tissue. If this is possible do so promptly, but if you can't completely remove it, never adopt half

way measures, let it alone. If you can radically remove it, you only have to wait for recovery, but if you only partially remove it, you do harm by devitilizing the tissues which nature is using as a defence. In the general treatment, diet is of the first importance. Give good, nutritious food, as beef, mutton, chicken, potatoes, milk and eggs. Give as a stimulant good old rye whiskey, administered in cold water before meals; beer and sherry is also good. They should be clad in good, warm flannels, in order to be able to take exercise, no matter what the state of the weather be. Climate markedly influences the progress of the disease, a high country, with dry atmosphere, such as at Thomasville, Ga., is the best. Cold baths should be taken regularly, they tone up the system and assist him in standing cold weather. Tonics of various kinds should be given, as gentain, iron and nux vomica. Alteratives should be given, of which Guaiacol and Cod Liver oil rank first. Cod Liver is not only a good alterative, but is also a splendid food. Never use emulsions, they are a delusion and a snare, only containing about 10 per cent. of Cod Liver oil. Give pure Norwegian oil, half an hour after meals; in this time the food will have been digested and passed into the small intestines. Commence with a teaspoonful and steadily increase the dose to a tablespoonful. If the stomach refuses it, wait a week or so and commence it again. I do not believe the good effect of Cod Liver oil is so much from the alterative effect of the Iodine it contains, but it acts well on account of the fat it contains; pure cream is almost as good, administered in quantities from a half to a quart daily. Koch's tuberculin has almost lost its interest to the profession, but about five years ago it caused quite a stir among us. It is a yellow fluid, of alkaline reaction, made from the bacilli grown in glycerine and the germ is afterwards killed by heat. One drop of it produces marked effect, causing fever and inflammation, but its curative powers are "*nil.*" Its discovery has led to investigation, which will no doubt soon pan out a cure.

LECTURE XXXIV.

CLINICAL FORMS OF SURGICAL TUBERCULOSIS.

Tuberculous, Cold, Chronic, Wandering and Migratory Abscess are synonymous terms used to designate a collection of tubercular matter in tissues. The term abscess, as here used, does not accord with the definition of the term previously given, as they do not contain pus, but it is retained because it was used before the distinction and cause was discovered. It is a misnomer.

Cause.—Tubercular abscesses are always secondary manifestations of some tubercular lesion of long standing. They never occur primarily. They are frequently seen following tuberculosis of the spine (Pott's disease), hip joint disease (coxalgia) and glands. Therefore to cure them, your treatment must be directed to the primary focus.

Pathology.—We first have infection by the bacillus of Koch, it lodges in some portion of the ecomomy, grows and multiplies and sets up a chronic inflammation, with the formation of small miliary tubercles. These tubercles increase in size and number, and the infected area is transfered into a granular tubercular mass. As these tubercles contain no blood vessels and are therefore improperly nourished, they undergo coagulating necrosis, followed by caseation and liquifaction, and you have a fluid closely resembling pus, but it is not pus, because it does not contain pus cocci or pus cells. It is a white fluid, containing small lumps of dead tissue and sometimes bone crumbs. This material is held in position and prevented from being diffused into the adjacent tissue by a wall, which is nothing but the consolidation of granulation tissue which forms beyond the infected area. When incised, it will be found to be a thick, soft, bluish membrane, very vascular and thoroughly infected and should therefore be removed. As the abscess gets larger, the membrane stretches and grows; soon it begins to migrate, begins to wander through the tissues, which is accomplished by the physical law of gravity. If it commences on the neck, it

will travel down and point somewhere near the clavicle; if it commences in the back, it may travel and point in the groin. They point and break far distant from the primary focus.

Symptoms.—The cold abscess has some of the symptoms of a hot abscess, but lacks others. In an ordinary or hot abscess there is pain, heat, redness, swelling and fluctuation. The tubercular abscess gives no pain, redness or heat; the only symptoms it has of an ordinary abscess is swelling and fluctuation. The first symptom which attracts your attention is swelling, on palpation you get fluctuation, the swelling wanders, it was first high up in the back, and now threatens to burst in the groin. If the swelling is not attended to, it will become a dusky color, from pressure the skin becomes thin and finally ruptures and the tubercular material escapes. If the abscess points in the lumbar region, it is called a Lumbar abscess; if it points along the course of the psoas muscle it is called a Psoas abscess, and if it points in the iliac region it is called a Iliac abscess; but remember that the name of the region in which the abscess is located gives no indication where the primary focus is.

Diagnosis.—The diagnosis is based on the history, as if a man with Pott's disease, who has a fluctuating swelling on his back, or with hip disease, showing a swelling near the knee, upon the enlargement and fluctuation coming on slowly, accompanied by neither pain, heat nor redness. If the history and symptoms are not confirmatory, aspirate, draw out the fluid and examine it for the bacillus of Koch.

Prognosis.—A young, healthy adult has a greater chance of recovery than and old, enfeebled person. A small abscess gives better hopes than a large one. And it is more favorable if located where it is amenable to the surgeon's knife.

Treatment.—The treatment depends on the fact whether or not the primary focus can be radically removed. If it is in the glands of the neck, it can be removed, but if it is a vertebræ that is diseased, other means will have to be adopted which are more palliative.

The radical treatment consist of making a free incision, curetting the walls, following the various ramifications and removing all the infected tissue. If you can do this the wound will heal by primary

intention. Where this cannot be done, as when a vertebræ is involved, you must practice aspiration, irrigation and iodoformization. If you simply incise one of these abscesses, you condemn your patient to death, for no matter how carefully it is dressed, sooner or later it will become infected from without by the pus germ. Practice this method, which was devised about ten years ago and has saved many lives. Render the skin clean, take an aseptic trocar and with clean hands plunge it into the abscess, draw the skin to one side and plunge it in obliquely, thus forming a valve to prevent the escape of fluid when the trocar is withdrawn; withdraw the blade of the trocar and let the material escape through the canula. If the canula becomes plugged by the cheesy masses, pull them out with an aseptic wire prepared for the purpose. After the fluid has escaped, irrigate the cavity through the canula with a Tincture Iodine solution, throw it into the abscess repeatedly until it comes back untainted by the tubercular material; now dissolve in glycerine, olive oil or Ether enough iodoform to make a 10 per cent. solution (10 parts to 100 parts glycerine); as iodoform is poisonous, only inject the first time one drachm of the solution, and if this is well borne increase the amount. Withdraw the canula and the valve formed by the skin prevents the iodoform from escaping. Manipulate the part and so diffuse the iodoform into all parts of the cavity. Repeat the operation every ten days, increasing the amount of iodoform solution each time until the abcess disappears. While treating the abscess, build up the patient's general health with good diet, tonics, stimulants and plenty of outdoor exercise.

Tuberculosis of the Iris.—This trouble is not uncommon, but is rarely seen in general practice, being of such a nature as to belong to the opthalmologist.

Cause.—When the disease occurs, it is caused by direct inoculation, as a piece of infected filing penetrating the iris, by an operation performed by a dirty surgeon, or the germ may be floating in the blood and lodges in the iris.

Symptoms.—The symptoms are easily discernable. The nodules can be seen growing through the transparent cornea.

Diagnosis is made by the character and symptoms of the disease.

Treatment.—To do an iredectomy would be absurd; the whole

eye must be removed. Before performing the operation, examine the other eye and if it is diseased or he has tuberculosis in other portions of the body let him alone.

Tuberculosis of the Internal Ear.—This trouble is rare, though it sometimes occurs. The germ finds a lesion in the tympanum or semi-circular canals, locates and produces their baneful effect.

Symptoms.—Sometimes there is a discharge of tubercular material, but this is not constant; there is pain and deafness

Diagnosis.—The diagnosis can only be made by the microscopic examination of the discharge

Treatment.—Clean the ear thoroughly, split it open from behind, scoop out the diseased tissue and disinfect. In performing this operation there is danger of puncturing the mastoid cells, causing tuberculosis of the meninges and death.

Tuberculosis of the Nose and Throat.—This disease is common. It can be seen in any patient with phthisis pulmonalis if they have had the disease any length of time. The mucous membrane of the nose and throat becomes studded with tubercles.

Treatment.—The treatment is paliative, no radical cure being possible. Cauterize the nodules and dust with some antiseptic powder.

Tuberculosis of the Mouth and Tongue.—This disease is fairly common, and may occur by primary infection from eating infected food. After localizing, the germs rapidly multiplies, forming ulcers upon the tongue, tonsils, hard or soft palate. They are usually flat and oval, covered with a soft white membrane, which, when brushed off, bleeds freely. It may be mistaken for syphilis or cancer.

Diagnosis.—The differential diagnosis from syphilis and cancer is difficult, but can be made by the use of the microscope by finding the bacillus of Koch. They can be told from epithelioma by the fact that epithelioma commences superficially and penetrates deeply; tuberculosis commences deep and comes to the surface; and in in epithelioma the neighboring glands soon becomes involved, while in tuberculosis it takes a long time. It can be told from syphilis by administering Iodide Potash, and if it is syphilis there will be marked improvement, but will have no effect if it is tubercular.

TREATMENT.—The treatment consist in as radical removement as the part allows. It is situated on the tongue, remove the organ with a clean cut far from the ulcer. If the ulcer is on the hard or soft palate, cauterize it with the blunt knife of the thermo-cautery. Give detergents, mouth washes and stimulants.

LECTURE XXXV.

CLINICAL FORMS OF SURGICAL TUBERCULOSIS.—CONTINUED.

TUBERCULOSIS OF THE INTESTINES.—This is a fairly common trouble, and may occur either by primary or secondary infection. It is due to the implantation of the germ of Koch upon the mucous membrane of the intestines. If occurring primarily, the germ is introduced by the food or drink, milk being a common source of infection, especially in children; and if occurring secondarily, it is by extension of the disease from some other tubercular foci.

SYMPTOMS.—The symptoms are vague and illy defined. There is a feeling of weight in the abdomen, vague pains, general feeling of malaise, loss of appetite, strength and flesh. There is alternating diarrhæa and constipation, hectic flush, rapid pulse, sweating and prostration.

TREATMENT.—This disease properly belongs to the domains of medicine, and this accounts for the number of deaths from the disease. When the surgeon is called in, the bowels have generally become occluded and a laparotomy has to be performed. After opening the belly find the tubercular area, which is usually near the ileo-caecal valve, and resect it. Many patients have been treated in this manner and recovered. In performing this operation observe the usual aseptic precautions, make your incision, draw out the gut, remove the diseased part and then either suture the ends together with catgut or use a Murphy button. Intestinal surgery has made rapid strides in late years. I have resected as much as sixteen inches of the gut with recovery, using the Mur-

phy button in the operation. Theorists claim that the Murphy button has seen its day and recommend the old method of suturing, but not so; it is true that the Murphy button is not without disadvantages, but scientists will soon give us a perfect device and it will be on the order of the Murphy button. It is certainly the best device yet invented.

Tuberculosis of the Rectum.—This trouble is very common. Three per cent. of people suffering from tuberculosis of the lungs have a tubercular fistula. It is always secondary, and due to extension from some pre-existing focus. In a previous lecture, you were advised to operate on these cases, simply to give relief. A tubercular woman came to me some time since suffering severe pain on defecation, was run down in health and very much emaciated. On examination I found the rectum studded with tubercles and also a tubercular stricture. I dilated the rectum with bougies and my thumbs, removed the tubercles with a spoon, irrigated the rectum with an Iodine solution and removed her from the operating table. I then washed out the rectum the next day with water, and then an iodine solution and inserted a suppository containing *30 grains* of iodoform, this was repeated for a while, and when I last saw her, the improvement was remarkable.

Tuberculosis of Tendon Sheaths.—Tuberculosis sometimes attacks tendon sheaths, especially of the tendons at the wrist joint, constituting a disease known as Tubercular tendo-synovitis. It was long thought to be only of secondary infection, due to extension from some tubercular joint, but lately it has been proven to be also of primary infection (brought by the blood), and extending to joints or other parts unless checked.

Symptoms.—The symptoms are plain. There is a slow forming swelling along the tendons line, which is painless and fluctuates. It ususally commences in the flexor tendons in the palm of the hand, extending beneath the annular ligament to the middle of the forearm. There is a specific formation of granular tissue within the tendon sheath, the sheath is separated from the tendon by a yellow fluid, which contains the characteristic rice bodies. These bodies are coagulated fibrin and are very infective.

Treatment.—If the disease is left alone, death invariably occurs from involvment of other tissues. Operative measures should be

prompt and thorough. Render the part bloodless with Esmarch's bandage and apply a tourniquet, make the skin clean, as the wound must heal by primary intention. Make a long sweeping incision, exposing the whole of the tendon, allow the fluid to escape, irrigate with a Tinct. Iodine solution, and then with a sharp spoon, curette out all the infected tissue, clipping all resisting tissue with scissors, scrape the tendon until you come to healthy tissue and if necessary resect it. If the tendon is situated deeply, don't hesitate to sever the tendons in your way, and the same must be done if the annular ligament keeps you from doing thorough work. After completing your work, suture the tendons and annular ligament, unite the wound with catgut, put the arm on a splint to prevent contraction and dress with plenty of cotton. Don't remove the dressing for two weeks, when, if your work was thorough, the wound will be healed. If the joint be stiff after removing the splint, use massage.

Tuberculosis of the Peritoneum.—This disease is of frequent occurrence. It is more common in women than in men. It is amenable to surgery and brilliant results follow. It may be primary or secondary; if the former, the germ is brought by the blood; if the latter (which is more usual), by extension from some other tubercular foci, as from the intestines, liver or fallopian tubes. The disease may be followed by two results, either *ascites* or watery accumulation in the cavity or by *plastic* or solid accumulation. When ascites results one or two things occur, the fluid either remains free in the cavity, or it may become confined by adhesions or an artificial wall for it is formed. When it is free, it resembles cirrhosis of the liver. When the patient lays on his back you get a dull sound on percussion, this is because all the fluid has by gravity gone backward and the guts protrude. When the fluid is circumscribed by adhesions, the viscera and omentum become stuck together and the symptoms resemble those of an ovarian tumor. When the disease results in a plastic or solid accumulation, you will find on cutting into the abdomen that the viscera are all glued together by a plastic gelatinous mass. The ascitic variety is curable, the plastic variety is not. We will therefore only discuss the curable variety.

Diagnosis.—It can only be told from dropsy when the fluid is free by a careful examination of each organ, by the history and by

introducing the trocar, obtaining some of the fluid and examining it under the microscope. It is impossible to tell the circumscribed variety from an ovarian tumor, as it usually occurs in women, grows slowly and fluctuates on deep pressure; however, both conditions demand operative methods, and you can tell the difference after entering the belly. The amount of fluid varies from one or two pints to eight or ten gallons, it is amber colored and contains rice bodies.

Treatment.—Open the belly and let the fluid escape, when it is localized by adhesions break them down. Examine the ovaries, fallopian tubes, appendix, glands and omentum, and if any of them are diseased, remove them. Irrigate the cavity with gallons of hot water, dust with iodoform in unmeasured quantities, put in a large glass drainage tube, which should extend to the bottom of the cavity or "cul de sac" in front of the rectum, suture the wound and instruct the nurse to empty the cavity daily; the first day there may be as much as a pint of fluid, but it gradually disappears, when you can remove the drainage tube.

Tuberculosis of the Skin, Lupus, Lupus-Vulgaris or Scrofuloderma are synonymous terms used to designate a disease of the skin caused by the tubercle of Koch. The disease is not so common as might be expected from the large area exposed.

Pathological Anatomy.—The disease is most often seen on the face and hands, the germ being inoculated through a crack or abrasion. The bacilli locates, produces their toxins which causes a chronic inflammation, tubercles form and approach the surface, finally from pressure the skin dinintegrates and leaves a raw surface exposed. Soon the wound becomes infected by the pus germ and a large ulcer forms as a result of double infection. If it is on the face, other tissues become involved, and the cheeks and nose may be eaten away.

Diagnosis.—The disease is often difficult to differentiate from cancer and syphilis. First try and obtain the history of the case. If the family is tubercular, make a microscopic examination of some product of the disease for the bacillus of Koch or inoculate a guinea pig and watch the results. It can be told from syphilis by the use of Iodide Potash, which markedly influences syphilis, but has no effect on tuberculosis. The microscope will differentiate it from cancer.

Prognosis.—The prognosis is unfavorable. The patient usually dies of Phthisis pulmonalis.

Treatment.—Arsenic in three minim doses seems to do good, administer tonics, stimulants and good food. The local treatment consist in the radical removal of the diseased tissue. If it is possible use the knife, cut through healthy tissue and remove the diseased tissue bodily, then assist healing by skin grafting. If this is not advisable, curette out all the infected tissue, dust with iodoform and dress antiseptically. As fast as the nodules reappear attack them with the curette or thermo-cautery. Koch's tuberculin is said to do good in this form of the disease.

LECTURE XXXVI.

CLINICAL FORMS OF SURGICAL TUBERCULOSIS—Continued.

Tuberculosis of the Female Genital Organs.—This disease is of rare occurrence. It has only been recognized in the last few years, before then it was confused with cancer and syphilis, but under modern researches it was found to be tubercular in nature. It may attack any portion vulva, vagina, uterus or fallopian tubes. When the vulva is attacked, it resembles lupus, it is nodular, uncerative and caseous and the bacillus of Koch is found in the nodules on examinations. It sometimes involves the mucous membrane of the vagina, tubercular ulcers are formed, which show the characteristic bacillus on examination. The mucous lining of the uterus may be attacked, causing tubercular endometritis, the lining becomes thickened, readily bleeds and there escapes a nasty, fetid discharge, ulcers form, followed by caseation. When the fallopian tubes become involved, the fimbriated end becomes agglutinated and hermetically sealed, the opening into the uterus also is closed and a saucer shaped swelling is formed.

Cause.—The disease is always the result of primary inoculation, it is never secondary by extension from other foci. One investigator has taken bitches and injected the bacilli into their vagina and tuberculosis resulted. Infection in women is also due to direct contact with the germs. It is brought about by their having connection with men having tuberculosis of the penis, or even having the disease situated elsewhere, the germ being carried in the semen. The disease may occur less directly, as by an operation performed on these parts by a dirty surgeon using contaminated instruments and syringes.

Symptoms.—The symptoms depend on the anatomical seat attacked.

Diagnosis.—The diagnosis is based on the appearance and can be made positive by the microscope or by inoculation.

Prognosis.—The prognosis is good provided the disease be taken in its incipiency and properly treated, but it is bad if the disease has existed for any length of time.

Treatment.—The general treatment consist in building up the patient's general health by administering tonics, strychnia, Cod liver oil, guaiacol and good nutritious food. The local treatment consist in the radical extirpation of the diseased tissue if possible. If it is on the labia, excise it; if on the vaginal mucous membrane, take out a section of its wall; if on the cervix, amputate it; if involving the mucous lining of the uterus, curette it, irrigate and pack with iodoform gauze or else perform a hysterectomy; if the fallopian tubes are attacked, perform a laporotomy and remove them. When the disease attacks the fallopian tubes, it is impossible to diagnose it from Pyosalpiux, but both demand a laporotomy. If in doing an operation for this disease or pyosalpinx, and the tube is found so adherent as to be impossible to remove it, split it open, curette it and put in drainage.

Tuberculosis of the Male Genital Organs.—Tuberculosis of the male genitals is more frequent than of the female genitals, and is due to the same causes. The disease may attack the glans penis, urethrae, epididymis or seminal vesicles. It is usually a variety of lupus when attacking the glans, it becomes ulcerative and caseous, and on examination the bacillus of Koch is found. When it involves the urethrae, it produces Tubercular urethritis; the

whole mucous lining becomes studded with nodules. When attacking the epididymis, it is characterized by the formation of hard swellings in the scrotum. The nodules are usually on one side only, they increase in size, but cause no pain. If not properly treated, the disease will be rapidly disseminated, resulting in death. When the disease attacks the seminal vesicles, it can be diagnosed by the pain at the base of the bladder, sexual neurosis, by the condition of the mind, and the finger placed in the rectum finds them enlarged.

Prognosis.—The prognosis is based on the anatomical location, extent and progress of the disease and on the treatment applied.

Treatment.—The general treatment consist of the means heretofore given to build up the general health. The local treatment depends on the location and extent of the disease. If the disease is on the glans penis, amputate it; if the epididymis is involved, resort to castration if only one testicle is involved, if both are involved don't operate, not on account of producing impotency, but because the disease has made such progress that the operation would be useless. When castrating for this disease, take out all the vas possible; split open the whole inguinal canal up to the internal abdominal ring, and take out all the cord possible; don't ligate the cord as a mass, for if you do you will ligate one of the most sensitive nerves in the body, and the ligature will slip also, causing death from hemorrhage. Ligate it in numerous sections, and if it bleeds after removing the forceps, ligate again. When the seminal vesciles are involved, you have a difficult and hazardous operation to perform. Make an incision through the perineum, push the prostrate forward, the rectum backward, dissect with your finger until you find the vescile, peel them off and ligate the arteries. In performing the operation you are liable to produce a vescial fistula.

Tuberculosis of the Bladder.—This is a fairly frequent trouble and occurs either primarily or secondarily. It occurs primarily when the germ is directly implanted in the bladder and first attacks its surface, and is secondary when the disease extends to the bladder from a pre-existing foci, as the peritoneum or vas, and this form is more hopeless. The disease occurs more frequently in women than in men.

Symptoms.—The symptoms come on slowly and insidiously, and at first it cannot be told from Cystitis. There is a feeling of weight or heaviness in the pelvis. He complains of a burning sensation and cannot long retain his urine; he can't go at first a half an hour without micturating, then he has to go every ten minutes, this is because of the inflamed and irritative condition of the bladder. Micturition soon causes great pain and spasm of the bladder. The urine at first clear, in twenty-four hours becomes cloudy from mucous, which normally is just sufficient to lubricate the surface, but now makes up half the urine and is stained slightly with blood.

Diagnosis.—The diagnosis is based on the family history, and can only be told from cystitis by the microscope and by inoculation.

Prognosis.—The prognosis is very grave, only a few cases being curable.

Treatment.—The general treatment should be as heretofore given. The paliative treatment consist in irrigating the viscus two or three times daily. Take an ordinary rubber catheter, boil it for three or four minutes. Now as to the lubricant to use, some recommend castor oil, carbolized vaseline (but it has been proven that carbolic acid in grease is not antiseptic), and neither do I like castor oil, use pure glycerine as a lubricant. Pass the catheter gently into the bladder and allow the viscus to empty itself, now fasten a fountain syringe to the catheter and irrigate with any of the following, having them at a temperature of 100 degrees F.: Pure water, normal saline solution, 2 per cent. solution boracic acid, Thiersch's solution (which is salicylic acid two parts, boracic acid twelve parts and water to make a thousand), 1 per cent. solution of acetate of aluminum or a 2 per cent. solution of chloral hydrate. Repeat the irrigation until the solution returns clear. With the progress of the disease, more radical measures must be taken; make him an artificial urethrae; to do this make a suprapubic incision and allow it to heal, except at one point, by this means he can urinate without pain. One experimenter is removing the bladder from dogs, and he says they do well. He extirpates the bladder and implants the ends of the ureters in the rectum, and he claims with the exception of a slight dribbling of water in some and diarrhœa in others the dogs do well. This may in the near future be applied to man.

TUBERCULOSIS OF THE LYMPHATIC GLANDS.—This is a very common disease, so common is it that you can't walk down the street over ten blocks without seeing two or three cases. It is spoken of by the laity and ignorant physicians as Scrofula and treated with Iodine. They occur most frequently in the cervical glands, but are sometimes seen in the glands of the axilla. They give no pain, but gradually enlarge and involves neighboring glands.

CAUSES.—The essential cause is the bacillus of Koch, directly implanted in the tissues, or inherited if you believe that theory.

PATHOLOGY.—A person having eczema, a slight wound inflicted while shaving or a decayed tooth, has an "*infection atrium.*" The germ enters through one of the atriums and is carried by the blood to the gland. They attack the gland, producing a chronic inflammation, tubercles form and undergo caseation and finally the gland is one solid tubercular mass, and soon other glands are involved. If left to nature unchecked, one of the glands will burst and the liquified tubercular material escapes into the para-glandular tissue, which the germs attack and a cold abscess forms, which may irrigate and point under the clavicle. It soon ruptures and becomes infected by the pus germ, which sometimes causes death in a short while; again, from the virulency of the infecting pus germ, the whole mass is changed into pus and the patient is cured.

SYMPTOMS.—The only symptoms is a slow, painless enlargement of a gland in the cervical region. Other glands soon become involved and there is a chain of enlarged glands from the back of the ear to the sternum.

DIAGNOSIS.—The diagnosis is based on the history and confirmed by the microscope and by inoculation.

PROGNOSIS.—The prognosis depends on the extent and progress of the disease and on the ability of the surgeon consulted.

TREATMENT.—The logical thing to do is to radically remove the diseased gland. The operation is frequently performed with brilliant results, but it takes a daring surgeon, one of ability, and the anatomy of the neck with its large blood vessels must be known. Shave the neck, render everything aseptic about the operation, make an incision parallel either with the anterior or posterior border of the Sterno-cleido-mastoid muscle, or make an S-shaped incision, commencing at the chin. Go through the

Platysma Myoides muscle, and if only the superficial glands are involved, you can easily remove them with the handle of your scalpel. If the deep glands are diseased, cut the sterno cleido-mastoid muscle, reflect it, push aside the arteries, veins and nerves and let an assistant hold them out of the way. Ligate any artery that is necessary and cut the spinal accessory nerve if you find it necessary, remove the glands thoroughly or else let them alone, suture the sterno-mastoid muscle, unite the skin, leaving in a drainage tube, dust with iodoform gauze, immobilize the neck and don't remove the dressings for three weeks, unless there is fever, pain or the dressings become saturated.

LECTURE XXXVII.

CLINICAL FORMS OF SURGICAL TUBERCULOSIS—CONTINUED.

TUBERCULOSIS OF BONE.—This is a chronic inflammation of bones, due to the specific bacillus of Koch. It is fairly common, occurring next in frequency to tuberculosis of the lungs and lymph glands. It attacks all classes of bones, but chiefly the extremity of long bones, though sometimes attacking the vertebræ, carpus, tarsus and bones of the skull. When the disease attacks long bones, it usually begins at the junction of the epiphysis with the diathesis, this is explained by the fact that the bone is least mature at this point, new cells are being formed and the blood vessels are only rudimentary.

CAUSE.—The essential cause is the bacillus of Koch. The predisposing cause is anything which lowers the vitality of the bone as a traumatism or injury, making a point of least resistance, where the germ finds suitable soil in which to localize and propagate.

PATHOLOGY.—The germ enters the blood through some "*infection atrium*," or from some pre-existing focus, and is carried to some point of least resistance, which, if in bone, is usually at the

junction of the diathesis and epiphysis. There is chronic inflammation set up, which stimulates the fixed cells to proliferate and epithelioid and giant cells are formed, leucocytes are poured out from the now porous vessels and tubercles are formed, they soon undergo coagulating necrosis, caseation and liquifaction. Slowly and insidiously the focus enlarges until the periosteum is reached, this is broken down and the paraperiosteal tissues become involved. The process now becomes rapid, attacking fascia, muscle and connective tissue and a tubercular abscess is formed, this, after burrowing beneath the different structures, at last opens and discharges through the skin

Symptoms.—The general symptoms are illy defined, and it is often taken for typhoid fever. They come on insidiously and do not reach a high intensity, there is a slight fever, characterized by continuing from day to day with slight intermission, it is of a hectic type. There is emaciation, loss of strength and vigor, anorexia and a peculiar progressive anemia. The local symptoms are more marked, there is pain about the part which is not acute and can only be found out by questioning the patient. The pain is variable, it is a boring, gnawing pain, and not a darting neuralgic pain as in suppurative osteomyelitis; it is pathognomonic in this disease for it to have nocturnal exacerbations, it is not severe enough to awaken the child, but it starts with a sharp cry, grits his teeth and contracts the muscles, and before the mother reaches the bedside is asleep again. The pain is not always referred to the seat of the disease, as if it is seated in the upper third of the femur, the pain will be referred to the knee; if in a vertebræ, it will be referred to the stomach. Tenderness is an important feature, it not only helps in locating the disease, but also tells you the extent to which the disease has progressed. Swelling is a late symptom, not occurring until the periosteum has been perforated. Redness is not present until the cold abscess approaches the skin, which becomes first red then livid. Atrophy of the limb is an invariable occurrence, due to non-use of the limb and to the action of toxins on the trophic nerves.

Diagnosis.—The diagnosis is based on the history and symptoms. To approximate the size of the diseased area, probe with an aseptic needle, when loss of resistance is felt, mark the needle,

push it then to the other side and mark it again, the distance between the marks gives the extent of the abscess. Now use an aspirator, remove some of the fluid and submit it to a microscopic examination.

Prognosis.—The prognosis is good, provided the diseased bone is accessile to surgery. Bone has great resisting power and may get well spontaneously, if not radical surgery will usually eradicate the disease.

Treatment.—The constitutional treatment is that for tuberculosis in general. The local treatment consist in giving the part absolute rest, putting the diseased part in a cast if necessary to accomplish it. If this does no good, practice Igni puncture, take a red hot iron or a thermo-cautery, have it at a white heat and plunge it through the tissues into the diseased bone, make two or three punctures if necessary. This does good by giving drainage, the heat kills all the germs it comes in contact with and it also stimulates the bone to plastic regeneration. If this fails, use parenchymatous injections of Iodoform. The iodoform does not act so much as an antiseptic, but it inhibits the growth of the germs. If all these methods fail, you must resort to the knife, and when once you commence operating never stop until you have radically removed all the diseased tissue. Render the part bloodless and aseptic, cut through the soft tissues and expose the bone, chisel through the bone and remove the diseased tissue with a curette, first removing the sequestrium with forceps, sterilize and pack with gauze or bonetchips. If after cutting down on the bone, you find the disease too far progressed for the above operation, resect a portion of the bone. Never amputate if it is possible to avoid it.

Tuberculosis of Joints, White Swelling or Scrofulous Joints are terms used to designate an exceeding common tubercular trouble involving articulations. It is most frequently seen in the knee, hip, elbow and shoulder joint, but may occur in any joint.

Cause.—The essential cause is the bacillus of Koch. The predisposing cause is some injury which lowers the vitality of the part.

Pathology.—The pathology is about the same as in tuberculosis of bone. The disease is either primary synovial or primary osteal; this means the germ must be implanted primarily on the synovial membrane when the disease is called Primary Synovitis,

or be implanted primarily on the bony surfaces of the joint and extend to the synovial membrane, when it is called Primary Osteal Synovitis. After localization, there are the characteristic changes, a chronic inflammation, formation of new cells, formation of tubercles, caseation and liquifaction. The part becomes distended, the capsule ruptures and a cold abscess surrounds the joint.

Symptoms.—There is hectic fever, loss of flesh, anorexia and progressive anemia. Locally there is swelling. The term white swelling, although unscientific, accurately expresses the condition. There is no heat or redness. Owing to the swollen condition of the joint and by the muscles above and below it becoming atrophied, the joint is larger than any other portion of the limb, and the limb appears spindle-shaped. The pain is variable, but has the pathognomonic nocturnal exacerbations. Nature flexes the joint to make room for the tubercular matter and to lessen the pain, and consequently there is deformity.

Diagnosis.—The diagnosis for each joint must be studied, as they differ, but the diagnosis for each is based on the history and symptoms and by obtaining some of the fluid by aspirating and subjecting it to the bacteriological and microscopic examination.

Prognosis.—The prognosis depends on the age, children giving a better prognosis than adults; on the general health and on whether or not the disease is confined to the joint.

Treatment.—Give tonics, stimulants, alteratives and good food. Physiological rest is usually all that is necessary in the first stage to effect a cure. Coxitis, diagnosed early and treated in this manner, is usually cured; put the patient in bed and rest the part by pulling the head of the femur out the acetabular cavity by weights, alllowing them to swing over a pulley. If this does not effect a cure, aspirate and withdraw the fluid and nature usually effects a cure. After the above fails, try tapping, irrigation and iodoformization. Render the part clean, cocainize it, pass the trocar through a flame so as to sterilize it and plunge it obliquely into the swelling. Allow the fluid to escape through the canula, irrigate the cavity with a Tinct. Iodine solution, inject about four drachms of iodoform solution and seal the opening with colloidion. Repeat the operation about every three weeks, and when the swelling has about subsided, place the limb in a plaster cast, so as to give the

joint physiological rest. If all the above methods fail to effect a cure, you must resort to more radical methods. Do a resection, don't hesitate to open the joint. Render the limb bloodless, and make an incision down to the patella if it is the knee joint diseased, saw this in two, cut the lateral ligaments, and with a rat tooth forceps and a pair of scissors remove the synovial membrane. If the bone is involved, curette it; follow out all the ramifications of the disease and remove the infected tissue. When the joint is opened and the disease found to have progressed too far to expect to get a fairly good joint from the above operation, resect the end of the bones, pin them together with bone pins and give the patient a stiff joint. As a last resort to save life, amputate.

LECTURE XXXVIII.

RICKETS—HEMOPHILIA—HYSTERIA.

Rickets or Rhachitis.—This disease was discovered by the English in 1850 and was called English disease. It is a constitutional disease, characterized by distortion of the skeleton. The disease is very common in Europe among the lower classes, but in America where sunshine and fresh air is plentiful, where better hygenic environments exist, the disease is rarely seen, and then only in negroes and poor white people.

Causes.—Heredity, improper food and bad hygenic surroundings cause the disease. Some observers claim the disease is hereditary; that it is transmitted from parent to offspring. This is not so; it is true it is often seen running through a whole family, the first children will be healthy, but the younger ones have rickets. This is because the first children receive better food, more fresh air and more clothing than the younger ones, simply because, as the family grows larger, from proverty, the food and clothing grow worse and the house becomes more crowded, and consequently the hygienic surroundings are not as good. The most essential cause

is improper food, especially when it is deficit of lime salts. This has been proven by experiments on young lions, when they were fed exclusively on lean meat, rickets developed; and monkeys fed on skimmed milk, without lime salts, also developed the disease, and were cured by feeding them on good food containing lime salts. You will never see rickets in a nursing baby, because the mother's milk contains the proper salts; it is seen in children fed on cow's milk and artificial food.

Pathology.—The pathology merely consist of defective deposits of lime salts in bones. When a child is born, its bones are soft and elastic, as it grows nature deposits lime salts in them which causes them to become hard and strong. In rickets nature can't do this on account of the deficiency of the salts in the blood. Curves are normally found in bones, caused by muscular contraction, but in rickets they are exaggerated and sometimes approaches deformity, caused by the weight of the body on the soft pliable bones.

Symptoms.—The shape of the head is peculiar. It is long and narrow at the forehead, sharp chin and the sternum is usually deformed, with a row of bumps running along each side of it. The pelvis is deformed from the iliac bones being pushed out by the mechanical weight of the body. The limbs are distorted; if the child crawled at an early age, the elbows will be bent; the knees are averted, due to relaxation of the joint and to pressure; the digestion is poor, the stomach not having had proper food, when it is given to the patient it is not digested and flatulence and diarrhœa follow.

Diagnosis.—The diagnosis is based on the symptoms, the shape of the head, bumps on the side of the sternum, arms and legs bowed, diarrhœa and indigestion.

Prognosis.—The prognosis is based upon your ability to place the child in better surroundings.

Treatment. --Put your patient in the best possible surrounding, send him to the seashore, use massage, hot bath, clothe in flannels and give him plenty of good food and fresh air. If it is a baby employ a wet nurse; if too old for this feed it on cream and milk sugar, and if it is old enough feed on beef steak and vegetables. Medicines do not accomplish much. Some recommend the admin-

istration of lime salts, but on account of their not being digested or assimilated they do little good. Give tonics to build up the general health, such as iron, etc., but the most important treatment is the proper hygenic surroundings and good food. This treatment does not cure the existing deformity, but prevents it from becoming worse, and the growth of the child may correct the primary deformity. Sometimes the deformity is so great as to demand surgical interferences. If the child is young you can reduce the deformity by manipulating the limb with the hands until the limb is straight and then applying a splint for some time. If the child is too old for this and the deformity is great enough to justify it, make an incision through the skin, lay bare the bone, and with a chisel and mallet strike the bone a sharp blow, set it as a fracture, put on a plaster cast and let it remain six weeks.

Hemophilia or Bleeders Disease.—This is a constitutional disease, characterized by a tendency to excessive bleeding from trivial causes. The disease is fairly frequent, being met with by a busy surgeon about once a year. It is exceedingly dangerous to operate on such patients. It is found nine times oftener in men than in women.

Cause.— The cause is absolutely unknown. There is no morbid anatomy or characteristic symptoms, you can only tell them by cutting them. The condition seems to be hereditary, some claim that it is the most hereditary of all hereditary diseases. It is transmitted from mother to son, this is peculiar; if a woman has six children, three girls and three boys, the boys will be bleeders and the girls will not, but the girls sons will be bleeders, and the sons of the boys will not.

Symptoms.—There are no symptoms except bleeding on all occasions from trivial injuries. The bleeding is not so profuse, but is continuous. It is neither arterial or venous in character, but simply welds up from the capillaries. The inflicted individuals can't be recognized, as they may be pale or ruddy.

Treatment.—Take the time and ask every patient before operating on them, if he is a bleeder or if any of his family are bleeders, if he answers in the affirmative, don't operate. When a bleeder is injured or cut, all you can do is to use styptics and pressure. You can't ligate the artery, for the wound you make

will bleed as much as the first wound, neither can you use acupressure.

Hysteria.--Hysteria may be defined as an instability of the nervous system, due to lack of control. It is the inability of an individual to regulate the manifestations of nervous phenomena, influenced by various stimuli. Sometimes a maximum stimulus will produce little effect, again a minimum stimulus will produce a maximum result. It is frequently met with, there will not be a day in your practice that your diagnosis, prognosis and treatment will not be confused by it. Hysteria is really a disease, and people who suffer from it deserve your sympathy and support.

Causes.—There is no condition, race, age or sex that is free from the disease, it is seen in the young and in the aged, in the intelligent and in the fool. It is more frequent from fifteen to twenty years of age, but may occur any time in life. In women about the time of the full development of their sexual organs, their desires are not gratified and consequent neurosis, it is frequent. It is more common in the women than in the men, the word Hysteria tells you this. Hysteria was the name used by the ancients because they thought it was due to some defect in the womb. Heredity can't generally be traced directly, but sometimes whole families are neurotic. Diseases of the generative organs is a common cause, as an inflamed ovary, endometritis, displaced uterus, hydrocele and varicocele. Anemia or lack of red blood corpuscles will cause it, but is readily cured by restoring the corpuscles. Dyspepsia is a frequent cause. Work, worry and whiskey combined will cause it, if these three conditions don't cause it, add the fourth, a wife, and you have all the essentials. Work without worry will not cause it.

Symptoms.—You can't classify the symptoms; sometimes they appear in one way, sometimes in another; they are truly like the Irishman's flea, you can't tell how they are coming. The psychical condition is horrible. They carry every action of the body through an analysis, they critically examine everything they eat and can describe in minutest detail its parts and constituents. They know more about the alimentary canal than the doctor, having read every quack pamphlet they can find; they dissect with repulsive boldness every evacuation from the bowels and describe them to

you with disgusting forwardness. Their sensory organs may be rendered peculiarly keen and sensative. They can't stand odors, a strawberry will make then faint. Light blinds them. There may be hyperasthesia or anæsthesia, motor paralysis, hemiplegia, paraplegia and aphonia (until you make them mad). There may be unconsciousness, globus hystericus or ball in the throat, diarrhœa or constipation, bladder palsy, can't hold their water and may pass as much as a half a gallon of urine in an hour, their face may be pale or flushed and the menstruation increased or diminished. They sometimes simulate surgical diseases, as a hysterical knee, hysterical spine or phantom tumor. They will have some sexual trouble and here your ingenuity is taxed, they imagine they have some veneral disease, and will discuss it and prove to you that they are right. They suffer from spermatorrhea and have been reading some quack book about it and you can't tell them anything, they are versed in all that pertains to the trouble.

Treatment.—The treatment requires tact, common sense and a strong personality. Inspire the patient with a moral tone that may overcome the uncontrollable nervous condition. Gain the confidence and trust of your patient and use it to his cure. Drugs do no good unless they smell and taste badly, and the drugs recommended are good only on this account. Injudicious sympathy is what does harm. Don't be needlessly rough, but keep on hand a supply of both sympathy and roughness, and if you can't gain their confidence in three days by sympathy, then make them fear you. The surgical treatment consist of an operation which makes a mental impression on the patient, as in a phantom tumor, give them chloroform, make an incision through the skin, sew it up, put them in bed and have a nurse to take their temperature every twenty minutes and starve them for three days.

LECTURE XXXIX.

SYPHILIS.

Syphilis, Pox or Lues, is a constitutional disease, due to a specific virus and is characterized by the formation of a local ulcer, which is followed by definite constitutional symptoms. The history of the disease is of great interest. The first classical treatise on the subject appeared in the fifteenth century. About this time there was an epidemic of the disease in Europe. By the compilers of this work, the origin of syphilis in Europe was credited to America; they maintained that its home was among the Indians of America, and that its occurrence in the old country was brought about by the return of sailors, who became inoculated on American shores, but the disease has a more lengthy pedigree. Many of the old records of Leprosy have been proven to have been syphilis, and a more perfect and accurate reading of the ancient scrolls and manuscripts have developed the undoubted truth that the disease existed in its most malignant form among the Egyptians and Chinese 2,000 years B. C. There are three conditions which can arise from impure coitus, Gonorrhea, Chancroid and Chancre. Gonorrhea is a suppurative inflammation attacking the urethrea, due to a specic germ. It is entirely a local disease and yields readily to treatment. Chancroid is a phagedenic ulcer, an eating sore, due to the inoculation of a specic virus. It is entirely a local disease, and when the sore is cured the patient is well. Chancre is entirely different from the above. It commences as a local ulcer at the point of inoculation, but the poison is soon diffused througbout the entire system and is difficult to eradicate. In the days of John Hunter, these three diseases were looked upon as one and the same, were treated alike and consequently many victims died from improper treatment. But John Hunter, the great surgical philosopher, thought he saw a difference in the diseases. He finally, from observations and experiments, stated before a society his views. He was hooted at, but he said he would prove his assertions by inoculating some of the pus of gonorrhea into his own arm. He

proceeded to the stage and against the protest of his friends inoculated some of the pus into his arm. Unfortunately for John Hunter and science, the individual from whom the pus was taken was infected with both gonorrhea and syphilis, a chancre developed on his arm and he ultimately died of syphilis. He turned apostate by this seemingly convincing evidence and said he was wrong. For fifty years no one had the audacity to question the matter, but after that time one of John Hunter's followers, named Ricord, announced that there was a difference and by careful experiments proved that there was one kind of chancre which was followed by constitutional symptoms and another kind which was entirely local. The first kind he called hard chancre and and the latter was called soft chancre. Bassereau, the next investigator, proved by experiments that the soft chancre was not syphilis at all, but a chancroid.

When syphilis was first written about in the fifteenth century, it was very malignant. Charles VIII. was carrying on a campaign at the time and one-half of his soldiers died from syphilis, forcing him to abandon his project. The disease was so virulent that those afflicted with it only lived a year, and then their nose, cheeks and ears were eaten away. But syphilis has become more and more attenuated, until to-day it is comparatively harmless. Although the disease is much less dangerous, when you inform a patient that he has syphilis, he is horribly frightened from the records he has read of its past malignancy. The question is frequently asked why the disease has become mild. It is because in these modern times we have better hygienic surroundings, better food, clothes and houses. We have better doctors, we do not salivate and not only is the above true, but the disease is milder from being so thoroughly disseminated among the people, giving us somewhat of an immunity against it by an attenuated portion of the virus being in our blood by inheritance. This has been demonstrated to be true. In Africa the disease was unknown until the white man appeared on its shores. The white man implanted it there, and it worked a most deadly and malignant progress on the negroes, while the white man, having it at the same time, had only a mild form. The principle was also established in other diseases. Measles was unknown in the Sandwich Islands until brought by missionaries, when it attacked the natives and killed nearly two-thirds of

them, while in this country, where the disease has raged for years, death seldom occurs. All these facts go to show that an immunity may be established by inheritance. The frequency of this disease is a subject I loath to discuss. As students you do not know how common it is, as practitioners you will be fully impressed with its prevalence. The frequency as given in text-books vary, some state that in the United States one person out of every twenty has the disease, while others state that it is one out of every five. The importance of a disease so prevalent can't be over-estimated. Usually when called to a patient, your responsibility only rests with the patient, but in this disease you have to look out for the wives and children, and also have to decide the advisability of marriage.

Cause.—Syphilis is due to a specific virus, this means it is due to some vague poison which has not been discovered. The reason the germ has not been isolated is because man is the only animal that can be inoculated, he is sole heir to the disease, and therefore no direct investigations can be made. One observer claims he has produced the disease in monkeys; this is probably not so, as he was working trying to prove his theory of evolution and not trying to isolate the germ of the disease. If syphilis hasn't been proven to be of microbic origin, why do I feel justifiable in saying it is due to a specific germ? Because syphilis so closely resembles those diseases which have been proven to be due to a germ; it resembles them in being contagious, can be transmitted from a diseased to a healthy person, in having a period of incubation; it is accompained by an eruption, in having a peculiar set of sequelae, and lastly by one attack immunizing the individual from subsequent attacks. From this consistent chain of analogy, we say syphilis is due to a germ, and the day is not far distant when it will be discovered, provided our Legislature will deem it of sufficient importance to contribute the condemned criminals to science.

Pathology.—No two observers follow the same lines in regard to the pathology, and I will take the bull by the horns and say the pathology is unknown and will not be known until the germ is discovered, when it can be accurately written.

Methods of Transmission.—Syphilis may be either hereditary or acquired. Hereditary syphilis is due to one or both parents hav-

ing the disease and from them is transmitted to their offspring. This subject will be discussed in a future lecture. Acquired syphilis is due to inoculation after birth. There are certain products which contain the virus. It was formerly thought that everything about an infected person could transmit the disease, tears, semen, saliva, etc. This is not true, the only products which can produce the disease are the secretions from the chancre or original lesion, this is the most important and severe; the secretions from mucous patches or small ulcers on the skin or mucous membrane and lastly the blood. If any of the normal secretions produce the disease, it is because the secretions from a chancre, mucous patch or blood is mixed with it. As by kissing an infected individual, the disease is transmitted from the secretions of the ulcers in the mouth being mixed with the saliva; or if transmitted from the milk of the mother to the child, it is because there is an ulcer on the nipple, and if contracted from coitus, it is not due to the semen containing the germ, but there is an ulcer in the urethrae and its secretion becomes mixed with the semen. The use of vaccine virus obtained from the scab on a person vaccinated was thought to cause the disease, and a great uproar was raised some years ago and societies were formed to prevent the use of the virus obtained in this manner; further investigation proved that the disease was not produced from the virus, but because the scab was carelessly removed and blood from the individual was contained in it, thus causing the disease. The invention of vaccine points have done away with the cranks who opposed the original method. The fact that the blood of syphilitics contains the virus and is inoculable is important to surgeons, for thousands of them have contracted the disease while operating through a slight abrasion or by accidentally cutting themselves. The virus or germ cannot enter the unbroken skin or mucous membrane, there must be an "*infection atrium*," and wherever the lesion or abrasion occurs, and the germ enters, a chancre is formed at that point: as a person having a crack on the lip, hair cut on the penis, or hang nail, and the part comes in contact with the virus, a chancre will be formed at the site of the lesion.

There are two ways of inoculation by syphilis, Immediate or direct infection and Mediate or indirect infection. Direct infection is the most common, and is caused by an abraded surface coming

in contact with the blood of a syphilitic person or the secretions from a chancre or mucous patch. The most frequent site of inoculation is the penis, caused by having an abrasion on the organ, which becomes infected by having connection with a syphilitic woman. Indirect infection is the innocent way and the way which all claim to have acquired the disease. The virus is not conveyed directly, but there is some in between media, as a drinking glass, seat of a water closet, a pipe smoked by a number of persons, and by catheters, towels and sponges which were not properly sterilized. However vague these stories are, there is a probability of this being true. There is on record an instance where an old midwife contracted syphilis in her occupation and a chancre developed on her finger. Although the disease was diagnosed, she did not stop her work until arrested, when it was found out that she had inoculated forty-seven women. She was imprisoned for life. Another case is reported where a man who had a long prepuce, met his old mistress and had connection with her. He carried the hidden virus to his wife, she contracted the disease and he escaped his just punishment. A similar case is reported where a married woman had connection with an old lover, and soon afterwards she had connection with her husband, she escaped, but the husband bore on his body the souvenir of the lovers' meeting.

Immunity.—Immunity to syphilis may be acquired, first, by having a genuine case. This gives absolute immunity. There is on record where individuals have had the disease twice, but doubts were raised if the first attack was really a genuine case of syphilis. Second, Colle's immunity. This is the immunity the mother has after giving birth to a syphilitic child, fathered by a syphilitic man. For instance, a syphilitic man marries a healthy woman; their children will be syphilitic, but the wife will not be infected, and father will be immune against the disease. Third, Profeta's immunity. This is the freedom or immunity which a person has, due to their father, mother or some of their forefathers or mothers having the disease. As a man having syphilis, his child will have the disease in a milder form, and his child's children will be immune or have a still milder form of the disease, and so on down for generations, until perhaps his grandchildren will be absolutely immune.

Clinical History of a Typical Untreated Case of Syphilis.—There are three stages of syphilis, primary, secondary and tertiary. Each of the stages are preceded by a period of incubation, so virtually there are six stages. A man has connection with a syphilitic woman, and during the process abrades the head of his penis and is inoculated. He goes home and sees the bleeding point, washes it and in two or three days it heals and he thinks no more about it. In three weeks a chancre develops at the point of the abrasion. It is a hard, indurated lump, which grows and gets as large as a filbert. Lines are seen running up the penis and the glands in the groin are tender and sore. The period from the time of inoculation to the formation of the primary lesion or chancre, is the primary period of incubation, and from that time to the subsidence of the above symptoms, is the primary stage of syphilis, which usually last about one or two months. After the subsidence of the above symptoms, the chancre and bubo disappearing, the second period of incubation comes on and lasts about six weeks. After the elapse of the above time, the secondary stage appears. He has little fever, is restless, disturbed, head ache, backache and he thinks perhaps he has caught cold. On arising one or two mornings after the above symptoms appear, he finds an eruption on his chest, which looks like the eruption of measles, his throat is sore, he is hoarse, and with a looking glass he discovers ulcers in his throat. Mucous patches form on the gums, in the axilla and groin and from them comes a foul discharge. His eyes are red and sensitive to light, his hair falls out from his head, eye lashes and pubis. These symptoms now get better and the third period of incubation comes on, which lasts a variable length of time, when the tertiary stage appears. There are deposits of gummata or nodules in all the tissues of the body, upon bone tissue, in the brain or spinal cord, in the heart, liver and kidneys and on the skin. These deposits ulcerate and if situated on the face, they eat away the cheek and nose, even exposing the teeth, nervous symptoms developed, suppuration sets in, he is a disgusting object and dies a slow and painful death.

LECTURE XL.

SYPHILIS—Continued.

SYMPTOMS OF ACQUIRED SYPHILIS.—Acquired syphilis is divided into three stages, primary, secondary and tertiary. Each stage is preceded by its corresponding period of incubation.

PRIMARY SYPHILIS.—This is the stage of the chancre and bubo. It has a period of incubation, that is, after inoculation or after a suspicious intercourse, no symptoms develop in from two to six weeks (average time three weeks). At the expiration of this time there comes on definite symptoms, which result in the formation of a chancre and bubo. A CHANCRE is the primary lesion of syphilis. It consist of a nodule which forms at the site of inoculation. It is usually seen on the penis in the male and on the labia in the female, but may appear anywhere, as in surgeons it appears usually on the finger, that being the most frequent site of inoculation. There are three varieties of chancre, superficial, deep and phagedenic. Do not think this means there is a difference in kind, all are due to the same specific virus, and are followed by constitutional symptoms, but they differ in type and degree, due to the different resisting power of the different tissues to the action of the virus. The same woman may give different men any of the varieties. The SUPERFICIAL CHANCRE is the most common type. Out of 170 cases it occured 140 times. It deserves its name from the depth it penetrates. It appears first as a macule and then becomes a papule. Before going any further, it is better to define four terms we shall use: A macule is a discoloration of the skin which is not elevated; a papule is a discoloration of the skin which is elevated; a vesicle is an elevation of the skin filled with water; a pustule is an elevation on the skin filled with pus. The papule of a superficial chancre is solid, of a peculiar red copper color, and the skin over it often desquamates or becomes scaly. The papule develops at the point of inoculation, increases in size until it reaches the size of an ammond; the skin then becomes broken, a watery discharge comes from it and an ulcer is formed. The papule has

a parchment like, indurated feeling when taken between the fingers. The DEEP OR HUNTERIAN CHANCRE is different from the above. It extends deep into the tissues, and is of rare occurrence. It forms as a macule, becomes a papule, which undergoes ulceration, and a deep ulcer forms, with sloping margins, protrudes above the surface of the skin and is bathed in a nasty pus. It is indurated like the superficial chancre, but instead of feeling like parchment, it feels like a split pea. The PHAGEDENIC CHANCRE is nothing but one of the preceding, which has become infected with a poison which causes an eating sore. It is sometimes spoken of as a migrating chancre, as it eats into the neighboring tissues, as if it is situated on the penis, it will extend entirely around the organ.

All of the above varieties of chancre are due to the same cause, their difference depends on the resisting power of the tissue attacked. The induration of a chancre is characteristic. In all inflammations there is some induration, but it gradually shades off into the adjacent tissue and it is hard to tell where it stops; but the induration of a chancre is different, its boundary line is well defined, it stops abruptly and if once felt, you will never forget it. It resembles the feel of a piece of parchment in the superficial variety and that of a split pea in the deep variety. A chancre is charaterized by being usually single, this is because you can't have syphilis but once, and the chancre is formed at the point of inoculation; it is not auto-inoculable; that is, if you have a chancre on the penis, you can't inoculate yourself from it on other portions of the body, but it is hetero-inocuable; that is, it can inoculate other people and a chancre tends to get well itself without treatment, in from six weeks to two months if it is kept clean. Chancroid is not a form of pox, for it is entirely a local disease. It sometimes complicates the chancre and causes it to be obscure. A chancroid is auto-inoculable and generally plural in number. There is such a thing as a mixed chancre. This is an unfortunate term, as it implies a cross between the diseases, but it means the individual has both diseases in the same manner as a child may have whooping cough and measles at the same time, each being separate diseases. In the primary stage we also have the development of the SYPHILITIC BUBO, which is an enlargement of the nearest lymphatic gland to the chancre. It may form in any

gland; if the chancre is on the penis, it forms in the groin; if the chancre is on the lip, it forms in the glands below the jaw, etc. The gland commences to enlarge as the chancre develops, remains as long as the chancre remains and disappears with its disappearance. The syphilitic bubo is generally bilateral, polyglandular, hard, movable and painless.

SECONDARY SYPHILIS.—The chancre of the primary stage has healed, the buboes have become smaller or disappeared, and there is a resting stage or the second period of incubation is on which last about six weeks. The patient begins to think the doctor has made a mistake, his future gets brighter and he is no longer troubled. At the expiration of the sixth week other manifestations appear, headache. backache, slight fever, anorexia and restlessness. These symptoms last from one to two weeks and on arising one morning he finds an eruption on his chest, but the above symptoms have disappeared. The eruption which appears is characterized by four features. First, Protean type; that is, it has no peculiar type, it is all mixed up, macules, papules and vesicles. Second, The eruption is symmetrical, if it occurs on one arm it occurs also on the other. Third, When it begins to fade it leaves a peculiar dusky red copper discoloration of the skin. Fourth, It does not itch. The eruption comes on suddenly and fortunately it never appears on the face or hands and can therefore be hidden by the clothing. From two days to a week sore throat comes on; the throat is congested and inflamed, there is difficulty in swallowing and there is hoarseness. On examination you will find the throat ulcerated on the upper part of the pharynx and on the fauces. Mucous patches now develop. This is a most disgusting symptom. They form on any portion of the body where the skin or mucous membrane is thin and subject to friction; in the mouth, under the penis, between the fingers, in the folds of the neck, rectum, etc. At first there is a little exudation beneath the skin or mucous membrane, which looks like a bursa; this enlarges, and the skin becomes a dusky red or copper color, it then disintegrates, leaving a raw surface from which comes a nasty discharge, which coagulates on its surface, giving the patch a greenish black appearance and emits a horrible odor. The lymphatic glands soon become enlarged all over the body. Don't confound this enlarge-

ment of the glands with buboes, as in this stage all the glands are enlarged and remain so throughout life. They enlarge slowly and painlessly, and are freely movable. Alopecia or loss of hair is a frequent symptom, the patient becoming bald and also loses his eyelashes. The eyes and ears also become affected, there may be iritis, conjunctivitis, etc., or inflammation of the tympanum or middle ear, causing great pain, and the disease is hard to manage.

TERTIARY SYPHILIS.—The above symptoms may have extended over a period of twelve months, but with "S. S. S." and other quack remedies, he thinks he has eradicated the disease. A rest comes on, but after this the third period of incubation, which lasts a variable length of time, the tertiary symptoms appear. This stage of the disease is rarely ever reached, but if it does, the patient is doomed, there is no cure for it. It is not syphilis, but the effects of syphilis. It is not contagious and can't be transmitted. There are depositions of gummata or nodules in the various tissues, composed of granulation tissue. The skin is seriously affected. There is one form called Tubercular gummata, which forms on the face, grows to about two inches in diameter, undergoes ulceration, the cells disintegrate, the nodule breaks down and a large ulcer is formed, eating away the cheek or nose. There is developed sometimes a squamous trouble of the arms and hands, and scales fall from the parts as from a fish. The nails become twisted and distorted, constituting Syphilitic Onychia. The mucous membranes are also affected. Gummata forms on the tongue and destroys the organ; in the throat, œsophagus, colon, rectum, etc. They are painless, ulcerate and are hard to heal, and if you do heal them, the contraction of the cicatrix produces stenosis, and the patient will be unable to swallow if the ulcer is seated in the throat or œsophagus. If it is in the rectum or colon, the patient may die before the surgeon recognizes the trouble. The disease may involve the solid viscera, as the heart, lungs, kidneys, etc. The ulceration of these organs causing death, or the contraction of the cicatrix so impairing the organ that it will not be able to perform its function. Nervous symptoms supervene. There are depositions of gummata on the brain and spinal cord, these by contraction impair the function of the part, causing idiocy, paralysis, locomotor ataxia, epilepsy, etc. The arterial system suffers, and the

trouble may be confounded with senile degeneration of the arteries, the difference being that the latter only attacks the large arteries, whilst in syphilis the small arteries are affected. In the senile trouble the arterial walls become calcareous in nature, while in syphilis there is a deposit of fibrous tissue and the contraction occludes the lumen of the vessel. Areolar tissue may also be the seat of these deposits, which ulcerates and burst upon the surface, leaving a deep ulcer. Bones and periosteum may be attacked, causing periostitis, osteitis and syphilitic nodes form on the subcutaneous surfaces of the tibia, ulna, radius and the cranial bones.

LECTURE XLI.

SYPHILIS—Continued.

Hereditary Syphilis, or syphilis due to disease of one or both parents, is characterized by there being no primary stage of the chancre and bubo. The symptoms commence with the secondary stage. This is due to the embryo not being inoculated locally, the virus being carried directly into the blood. Infantile syphilis is also a term applied to hereditary syphilis. This is unfortunate, as they are entirely different, for infantile syphilis may be hereditary or acquired.

Causes.—Hereditary syphilis may be caused by one of four conditions. First. By the mother being syphilitic, the father being healthy, their offspring may be born in the full bloom of syphilis, but it is usually of a mild type which is readily amenable to treatment. A syphilitic woman will give birth to a syphilitic child long after she is capable of infecting her husband. Second. The mother and father both being syphilitic. This is a much more frequent cause and in this case the disease in the offspring is very virulent and quickly terminates disastrously unless properly treated. Third. The mother acquiring syphilis after impregnation. Sup-

pose a healthy man and woman marry, the woman becomes impregnated and six months afterwards the husband acquires syphilis and inoculates his wife; the child was begotten by healthy parents, but the effect of the woman acquiring syphilis is thus stated. If the mother acquires the disease before the seventh month of pregnancy, the child will become infected, but if she acquires the disease after the seventh month the child will be born healthy. Fourth. The father inoculating the child, without infecting the mother. This seems improbable, but it is claimed by good authority to be true, while others equally as eminent dispute it.

Results to the Child of Having a Syphilitic Mother may be as follows: 1. Abortion or premature birth. The products of the cohabitation of syphilis is usually thrown out the wound before the third month. If you have a woman who aborts time and time again at or near the third month of pregnancy, treat her for syphilis, no matter what she says, it can't do any harm, and as a general thing does good. 2. Full term children born with syphilitic lesions. Suppose an abortion does not occur at the end of the third month and the woman goes to full term. The child in this case will be born in the full bloom of syphilis, or else be born healthy and develop the disease soon afterwards and in the secondary stage. In the latter event the symptoms usually develop in two or three weeks, but it may be as long as a month or even a year. But when the disease doesn't develop in a year's time, you can safely say that the child is out of danger. If the disease develops after a year's time, the child either had the symptoms of the disease during the first year and was overlooked or else it has acquired the disease from a wet nurse or by kissing a syphilitic person.

Symptoms.—The general appearance of the child is striking. It is shrunken and shriveled, eyes glassy, predernaturaliy bright and old looking. The skin is usually covered with an eruption, which is protean in character, distributed symmetricaliy, fades away and leaves a dusky red copper discoloration and it does not itch. There are mucous patches on the skin and mucous membrane, as in the mouth, between the fingers and in the rectum. The throat is sore and is manifested by what the old granny calls sniffles. The mucous membrane of the nose is thickened, and he is unable to breathe

through it, consequently he can't occlude his mouth with the nipple to nurse. The hair falls out and the glands all over the body become enlarged. If the child lives and the period of primary dentition comes on, the teeth will be diseased. They will be soft and crumbly, and as soon as they come through the gums, they are broken off and the child becomes snaggled toothed. With these symptoms the child generally dies of marasmus despite your treatment, but it may live and fight along and appear apparently cured. But when the second dentition comes on, characteristic appearances develop. Linear lines radiate from the mouth to the cheek, eye troubles develop, such as inflammation of the cornea, opacity of the cornea, etc. The second teeth are called Hutchinson's teeth. The incisor teeth, especially those of the upper jaw, being wedge-shaped, broad at the gums and tapering down. They project forward and are notched; that is, their cutting edge instead of being straight are curved.

SYPHILIS IN GENERAL.—Diagnosis.—As I have said before, this disease reposes a great responsibility on the doctor, and an early and careful diagnosis should be made, as it influences the whole life of the patient. Never deal with the disease lightly. If you find out that your patient has syphilis, tell him so at once. The diagnosis is largely based on the general history. If the disease comes under your observation in the secondary stage, it is easily diagnosed, but if the disease was acquired ten years before and was treated at the time, your diagnosis will not be made with such ease. They seem to have forgotten all about having the disease and it is hard to obtain their correct history. You can't believe a word they tell you, even though otherwise honest and reliable. You will have to use all kinds of strategy on them to get the truth. If a man comes to you, and although he may be a low, degraded, vile fellow and is abused and shunned by his neighbors, and you find a sore on his penis or some other suspicious place, don't treat him for syphilis until you make a positive diagnosis; but if a man comes to you who is looked upon as a saint or a pillar of a church and can pray louder than any other member of the congregation and shows a sore in a suspicious place, don't wait for a positive diagnosis, put him on anti-syphilitic remedies at once, as these remedies will cure one out of ten such cases. Confron-

tation is important in the diagnosis if it is possible to do so, as if the women has a chancre she has given the man a chancre and if she has a chancroid she has given him a chancroid. Inoculation may be tried, but never inoculate any one else, but the man who has the suspected chancre, and if it be a syphilitic sore, the inoculation will give negative results, but if the sore be a chancroid, a sore will develop at the site of the inoculation. None of these tests are conclusive, as the man may have both diseases. It is impossible to make a positive diagnosis until the secondary stage. Some microscopists claim they can diagnose the disease with the microscope, this is exceedingly doubtful. The differential diagnosis between a chancre, a chancroid, herpes, cancer and tuberculosis belongs to another department, but in regard to the difference between a chancre and a chancroid, I will simply give you a few points I have picked up in practice. A chancre has a definite period of incubation, a chancroid has not. A chancre never develops under one or two weeks, a chancroid develops in one or two days. A chancre is always single, a chancroid is always multiple. A chancre is not auto-inoculable, a chancroid is. A chancre is either a superficial or a deep Hunterian sore; if superficial there is no breach in the continuity of the skin and it feels like a piece of parchment beneath the skin; if it is a deep Hunterian chancre it has sloping margins and feels like a split pea; a chancroid has sharply punched out margins and is migratory. A chancre is indurated and the hardness is sharply defined from the adjacent tissue, stopping very abruptly, a chancroid is also slightly indurated, but the hardness gradually slopes off into the adjacent tissues. A chancre tends to heal spontaneously, a chancroid undergoes phagedenic ulceration and spreads. A chancre is always accompanied by buboes, which are bilateral, polyglandular, hard, freely movable and do not tend to suppurate, a chancroid is not usually accompanied by buboes, and if it is, the bubo is unilateral, involves only one gland, it is immovable, very painful and tends to suppurate. A chancre is always accompanied by constitutional symptoms, a chancroid is purely local and is never accompanied by constitutional symptoms. One attack of syphilis gives immunity to subsequent attacks, one attack of chancroid does not give immunity to subsequent attacks.

Prognosis.—The prognosis of syphilis is good. I have already stated that in former years the disease was very malignant, but in recent years it has become very much attenuated, and if properly treated it doesn't give much trouble. If a man comes to you and you suspect syphilis, give him a bottle of colored water, and if he has syphilis he will return in six weeks with the diagnostic symptoms, then if you treat him properly the symptoms will disappear in three weeks, and if he continues the treatment he will be entirely cured and will live to an old age and die from some other trouble. A great many observers claim that Gonorrhœa kills more people than syphilis. The prognosis is based on the type of the chancre, a superficial chancre is milder than a Hunterian chancre; on the character of the eruption, a macular, papular eruption gives a milder case than a pustular or vesicular eruption; on the general health, vigor and robustness modifies the disease and on the length of the patient's purse, a man who scuffles for a living, has meals irregular and badly cooked, has a harder time than a man who can afford a French cook.

Syphilis and Marriage.—This is an important question and one that will be propounded to you frequently. When a man comes to you with syphilis, or one that you know has had syphilis a year or two before and asks you the advisability of his getting married, tell him he will have to postpone it. Some authors claim that a man once having syphilis is never free from it and should not marry, but the majority of authorities and observers dispute this and claim that if a man goes three years without any of the symptoms of the disease being manifested, he can marry without any fears in regard to the future. So it is your duty as a doctor to see that a man does not marry until three years has elapsed since the last symptoms of the disease disappeared.

LECTURE XLII.

SYPHILIS—Continued.

Treatment.—The treatment of syphilis is divided into local, specific and general. They are usually carried on at the same time, but will be considered separately.

Local Treatment.—This is the treatment applied to the local lesions, as chancre, bubo, mucous patch, etc., and to prevent deformity and pain. It must always be re-enforced by the specific and general treatment. The local treatment of a chancre depends on the variety, the superficial and Hunterian variety requiring different treatment to the phagedenic type. If a man comes to you with a superficial or deep chancre, the first question that arises is the advisability of cutting it out. On this question authorities differ. Some claim that if it is cut out, the disease will be aborted, or if symptoms do develop they will be mild, while other equally competent observers claim that to excise a chancre does no good, constitutional symptoms always follow. My experience makes me belive that it is unwise to excise the sore. The disease is never local, it is constitutional from the very moment the lesion occurs and therefore excision can do no good. There is on record a case of a man that came to the doctor six hours after having connection with a syphilitic woman, and showed an abrasion on his penis. The wound was immediately cauterized, but in three weeks a chancre developed. So, as a general rule, let the chancre alone, but if the patient says he must continue sexual intercourse or the sore is on some portion of the body where it gives trouble, excise it for convenience sake and not for the abortive treatment. If you want to note the difference between an untreated and a treated chancre, get two patients and on one cauterize the chancre with nitrate of silver and paint it with a dirty salve; leave the other one alone, and the untreated chancre will get well first. A patient coming to you will demand some treatment, so prescribe the yellow or black wash, tell him to bathe in hot water night and morning and apply the wash. When he comes again give him a

mild antiseptic powder to use, such as iodoform or aristol. The phagedenic chancre demands prompt and heroic measures or there will be disastrous results. Immediately cauterize the chancre. In using a cautery in genito-urinary surgery it does not matter what kind you use, but your ability to use it. Never use nitrate of silver, it is a delusion and a snare, it is no good. Use Bromine, red hot iron or fuming nitric acid. The operation can be rendered painless with cocaine. After cauterizing, treat the burn with an antiseptic solution and dust it with some antiseptic powder. Syphilitic buboes should be let alone, as they do no harm, are painless and tend to spontaneously disappear. If, however, the mental condition of your patient demands it, paint them with Iodine. Never order a bottle of Iodine and a camel's hair brush and let the patient apply the drug, but apply it yourself. Paint round each gland very carefully, as if you thought too much of the drug would effect disastrous results. If he comes back complaining give a prescription for mercurial ointment and let him use that for a while. You have to feed them on bland medicines, which really do no good, but to give nature a chance. I do not teach you this to make you fakirs, but it is necessary to enable you to hold your patients and to keep them out of the hands of quacks. Sore throat should be treated locally with gargles or sprays. Chlorate of potassium, chloral, thymol, tincture of benzoin, etc., may be used in solutions. If the throat is congested and contains mucous patches, give him a spray containing a small amount of cocaine in a boracic acid solution. Mucous patches should be wiped off with some antiseptic solution, dried with a blotter and cauterized with Acid Nitrate of Mercury, after this apply some antiseptic powder. Alopecia deserves treatment. If it is insignificant, prescribe the "*Seven Sutherland Sisters' Hair Tonic*," but if it is rapidly falling out, leaving patches of hair here and there, order his head shaved, and then wash it night and morning with hot water and green soap and apply some hair tonic. All hair tonics contain about the same ingredients mixed differently. Quinine, Pilocarpine, Cantharides, Glycerine, Castor Oil and Bay Rum. Iritis or inflammation of the iris, if not treated, will result in either total blindness or serious impairment of sight. The iris may even become glued to the lens. The treatment consist of the unsparing use of atropia. Make a solution,

2 grains to the ounce of water, and drop two or three minims into the eye three times daily. This will keep the pupil dilated, and if adhesions form, the pupil being in this dilated condition, the sight can be restored with the proper glasses. Use antiseptic solutions freely, and use cocaine for the pain. A good mixture to meet all of the above requirements can be ordered, consisting of Boracic acid, Cocaine and Atropine in distilled water. Hot water applied to the eye frequently relieves the swelling and reduces the inflammation. Gummata and ulcers which form in the tertiary stage do not yield readily to treatment. You can try a salve, but they are rapidly being done away with in surgery. The best salve is a mixture of Calomel ʒi to Vaseline ℥i. Don't delude yourself by adding carbolic acid, as carbolic acid in grease is inert. If this does no good, use a collodion composed of Bi-chloride of Mercury, salicylic acid and collodion; paint this over the ulcer. It not only protects the ulcer, but causes the tissue it is composed of to disintegrate. As a last resort, cut out the diseased tissue, making your incision through healthy tissue and treat as a recent wound.

Specific Treatment.—This consist in either the administration of Mercury or Iodine. Mercury is an antidote for syphilis, it neutralizes the virus, but we do not understand its action. Some observers claim that it is decomposed and metallic mercury is deposited, which goes through the capillaries and pushes the syphilis out the back door. I believe it is due to the antiseptic properties of mercury, and this is one evidence of the disease being of microbic nature. When should you begin mercury and when must you stop it? No man living can say positively that a man has syphilis until the secondary stage, other diseases have almost the same set of symptoms as syphilis in the primary stage, and therefore never administer mercury until the early secondary symptoms appear. If you give it before this time, it is possible your patient hasn't the disease, or you may so mask the secondary stage that six months afterwards he appears well and you come to the conclusion that your diagnosis was wrong and the treatment is stopped; when the disease appears again it is in the full bloom of tertiary syphilis and your patient is doomed. So when a patient comes to you, and you suspect syphilis, don't give him mercury, prescribe some bland colored drug and wait until he comes to you with the secondary

symptoms of syphilis, when your diagnosis is certain. Then give him mercury and continue it for a year as continuously as possible. Now discontinue the drug and give him an occasional course of the drug during the next two or three years. The preparations used are Calomel, Blue Mass, Bi-chloride, Biniodide, Protoiodide, Ointment and Oleate. The drug may be administered by the mouth, inunction, fumigation or hypodermically. It may seem foolish to give you so many avenues of introducing the drug, but when you have a patient that can't take the drug by the mouth, you will be glad to know of other ways of administration. The mouth is the most satisfactory avenue of introduction. The bi-chloride is given dissolved in some bitter tonic as Tinc. Gentian or Cinchonae; the biniodide is used, but is irritating; the protoiodide is the best preparation, being less irritating and put up in convenient pill forms of a 1-5 grain each. The dose of the protoiodide will have to be determined for each patient. Never give an overpowering dose and salivate your patient, but go about it systematically. Give one pill after each meal, at the end of the third day give two after breakfast and one after each other meal, wait three days and give two after breakfast and dinner and one after supper, wait three days and give two after each meal and in this way gradually increase the dose every third day until the patient comes to you with colicy pains in the abdomen and his teeth feeling too long, then you may know you have almost salivated him. Now divide the number of the pills in half and you have the dose; that is, if he is taking six pills a day, give him three or half the dose which produces physiological symptoms. If the patient can't take the drug by the mouth, give it to him by inunction. For this purpose the oleate or ointment is used, the 20 per cent. oleate is the best, but is very expensive. In using the drug by inunction, take a piece the size of the end of the little finger, protect your hand with a glove and rub the drug in the skin where it is thin, as on the belly, inner side of thigh, in the axilla, etc. Rub it in a different place every night until you have made a circuit of the body, for if the same place is used two nights consecutively, it will cause irritation. Some authorities recommend the drug to be smeared on a band, which is worn around the belly over night; others smear the drug on the socks and friction from walking

causes absorption. If a patient is suffering from an acute lesion of the eye or brain and you wish to get him under the influence of mercury at once, administer the drug by fumigation. Take a cane bottom chair, seat the patient in it naked and enclose him in a gossamer, only leaving his head out. Place under the gossamer a bucket of boiling water to open the pores of the skin, then take 20 grains of calomel, place it in a tin over an alcohol lamp and place it under the gossamer. The calomal is volatilized, rises through the chair and is deposited on the body. Let him remain in the fumes for twenty minutes, then remove the bucket of water and lamp, and let him remain ten minutes longer, when he should be wrapped in a dry blanket and but to bed. Give him a bath the next day. Three such fumigations will cause salivation, but in these acute lesions never dread salivation, your object is to get the patient under the influence of mercury as quick as possible. Sometimes when rapid effects are desired, the hypodermic use of bi-chloride is used in 1-16 to $\frac{1}{8}$ grains three times a day. Make the injection deep down into the muscles, or else irritation follows with the formation of an abscess. Never use a needle over two or three times, as the mercury makes them brittle and there is danger of breaking them off in the tissues. Mercury is a drug greatly dreaded by the public on account of its abuse in the past, but if given carefully, persistently and intelligently, it is of the greatest value in the treatment of syphilis. It sometimes causes colicky pains and diarrhœa, for these give large doses of Sub-nitrate of Bismuth and change the preparation or mode of administration. Aphthous stomatitis may occur, if so, discontinue the drug for a while and use antiseptic mouth washes. Salivation may occur. The patient comes to you and says his teeth are too long and their edges sharp, gums tender or ulcerated and bleeds easily, tongue is swollen and congested, breath fetid and saliva is constantly dribbling from his mouth. In this case discontinue the mercury and substitute Iodide of Potash. Give a mouth wash and administer internally, the following:

℞

Potassii Chloratis
Pulv. Sulphur — $\left.\begin{matrix}\cdot\ \cdot \\ a\ a\end{matrix}\right\}$ ʒi

M. Ft. cht. No. xii.

Sig: One powder four times a day.

Iodine is not an antidote for syphilis, it has no effect on syphilis, but acts entirely on the products of syphilis. It is not used or does no good except in the tertiary stage. It causes disintegration of the gummata and restores the tissues to their normal condition. Appreciating the above facts, never give Iodine until the incipiency of the third stage, and then continue the drug as long as symptoms crop out. The preparations used are Tinct. of Iodine (in emergencies), Iodide potash, soda and ammonium. Iodide of Potash is the most popular preparation. The drug should be commenced with small doses and increased steadily to the point of tolerance. Order a saturated solution, commence with 5 minims after meals and gradually increase the dose until 40 or 60 minims are being taken or until untoward manifestations are noticed. It is well to know that in a saturated solution of Iodide of Potash, as usually prescribed, that each measured minim contains 1 grain of the drug, but each drop of the solution does not; that is, when the medicine is dropped the ounce contains 960 drops and when measured only 480 minims, therefore tell your patients to either measure the dose or double the number of drops ordered, when the medicine is simply dropped from the bottle. The evil effects of the Iodides are coryza and skin eruptions.

General Treatment.—While treating the disease locally and fighting the virus with mercury, don't forget the general treatment and therefore administer tonics, and such drugs that will assist the assimulation and digestion. Stop the use of tobacco, chewing causes irritation and the formation of mucous patches. Smoking also favors the formation of these patches, irritation being caused by the pipe stem or cigar. Whiskey must be withheld, as syphilis and alcohol give bad results, but in an old man who is used to his morning dram, let him have it. Care should be taken with the diet, a liberal supply of food may be allowed, but it should be easy of digestion. Plenty of outdoor exercise should be advised. Care should be taken in regard to the clothing; flannel or silk should be worn next to the skin, and cotton or linen prohibited, as the skin is depended on to assist in the elimination of the virus and mercury, and must therefore be kept warm. A hot bath should be taken three times a week, and a Turkish bath once a week. If the patient is full of malaria, give him quinine; if

anemic, give him iron; if tubercular, give him cod liver oil. If possible send your patient to the Hot Springs. I have served as resident physician at these springs, and am convinced that the medicinal virtues of the water is "*nil.*" The benefit derived is not from the water, but from the change of scenery, rest and the regular bathing. In town a man is worried with business and his family, and when he goes to the springs he gets mental and physical rest. The baths are no better than can be gotten at home in the bath tub, but at the springs they are taken regularly and thus the benefit.

LECTURE XLIII.

TUMORS.

The term TUMOR is often used indiscriminately by surgeons to designate all kinds of swellings, but should be limited in its application to neoplasms or new growth, composed of tissue, the result of proliferation of embryonal cells and existing as a more or less independent structure and having no physiological function. For a long time absurd and erroneous ideas of the nature and origin of tumors existed in the minds, both of the laity and the profession. Tumors were supposed to be parasites preying on the system, they were thought to be composed of material essentially different from that found in the human body, and in some instances to have a distinct circulation of their own. Johannes Muller was the first to teach that the tissues of which a tumor is composed always has its prototype in the body; Virchow dispelled the belief that a tumor could develop "*de novo*," by proving that it always had origin from pre-existing cells of a similar type, and Cohnheim advanced a theory to explain their occurrence, which, though incapable of being demonstrated, is extremely plausible. According to Cohnheim's theory, there must have been in the embryo during its development more cells produced at some point than was neces-

sary for the formation of that particular region. These cells, not utilized by the growth of the embryo, were arrested in their further development, and remained in a dormant condition. If their activity is excited later they proliferate and form a tumor. It is extremely important, before going further, to draw a sharp line of distinction between tumors, inflammatory swellings and retention cysts. All true tumors are composed of new tissue, produced by proliferation of embryonal cells. All inflammatory swellings result from the action of pathogenic microbes upon mature tissue cells. All retention cysts are due to the retention in a preformed space of a physiological secretion or excretion.

Classification.—Until the publication of Virchow's paper, in 1863, no attempt had been made to classify tumors, and the terms used to designate the different varieties were based upon their appearance or chief characteristics, such as scirrhus, cauliflower, polyp, fungus, haematodes, etc. The modern classification of tumors is based either upon their histological structure or upon their clinical behavior. Thus tumors are said to be Epiblastic, Mesoblastic or Hypoblastic, as their structure indicates an origin from the embryonal cells of the Epiblastic, Mesoblastic or Hypoblastic layers of the foetus. Tumors are said to be Benign or Malignant, as their clinical behavior indicates an innocent or a vicious tendency. Benign tumors are usually homologous or composed of tissues resembling those in which it originates, have a distinct capsule, are freely movable beneath the skin, are poorly supplied with blood vessels, grow slowly, cause little pain, do not infiltrate adjacent tissue or involve neighboring glands, and when completely removed never recur. Malignant tumors are heterologous or composed of tissues widely differing from those in which it originates, has no capsule, are not movable, are richly supplied with blood vessels, grow rapidly, cause great pain, tend to infiltrate adjacent tissue, and to involve neighboring glands, and frequently recur after radical extirpation.

Cause.—The essential cause which produces a tumor is the existence in the body of dormant embryonal cells. The exciting causes which produce a tumor are conditions which awaken the energies of the latent cells, and inaugurate their proliferation. A combination of the two etiological factors is necessary, for the cells of the

matrix would remain permanently in a latent condition, unless stimulated, while all intrinsic and external exciting causes without a matrix upon which to act would be powerless to produce a tumor. Among the exciting causes may be mentioned (a) heredity, a tendency to certain forms of tumors being transmitted from parent to offspring; (b) race, the negro is much more predisposed to Fibroids than the white race; (c) climate, the inhabitants of tropical regions being more liable to malignant troubles than those who dwell in more temperate climates; (d) age, puberty and senility both being periods at which neoplasms develop; (e) sex, men apparently being more frequently the victim than women; (f) occupation, the refined and cultivated are afflicted with tumors more frequently than the laboring class; (g) traumatism, such as a fracture sometimes excites the formation of a tumor; (h) irritation, such as a jagged tooth, or the hot stem of a pipe produces cancer; (i) inflammation is often followed by tumor production; (j) contagion is a doubtful factor.

Pathology.—(1) Structure; all tumors, whether epiblastic, mesoblastic, hypoblastic, benign or malignant, are composed of a parenchyma and a stroma of fibrous tissue, the same as an ordinary gland. In some instances the parenchyma or the essential cells, are in excess of the stroma and the tumor is soft, again the stroma is in excess of the parenchyma and the tumor is hard. (2) Shape; the shape depends entirely on accidental circumstances, the tumor always growing in the direction of least resistance. They may be oval, smooth, round, noduiated, broad, flat or pedunculated. A sessile tumor is one which grows on a broad, flat surface; a pedunculated tumor is constricted at its base; an oval tumor is one that is expanded in all directions. Their surface may be smooth, lobulated or nodular. (3) Density; some are hard and are then composed mostly of stroma; some are soft, and are composed mostly of parenchyma. Some are compressible and are then very vascular, and pressure causes compression by driving the blood out; others fluctuate when pressure is made unequally on it, this is due to the fluid it contains. (4) Color; this depends upon the tissue producing the tumor, it is red in myomata or muscle tumor and white in a tumor of the connective tissue; if vascular, they are bright red in arterial and blue in venom tumors; if they undergo

fatty degeneration their color changes to yellow. (5) Growth; the rapidity of their growth depends upon the cells from which they are formed, connective tissue cells growing much faster than nerve cells, and upon their vascularity, the greater their blood supply the more rapid their growth. (6) Morbid changes; these are identical with those in similar normal tissue. They may undergo inflammation, suppuration, etc., due to microbic infection. Hemorrhage may occur from rupture of a blood vessel. (7) Degenerative changes; these degenerative changes are the same which occur in the liver, kidney, etc. They may undergo fatty, mucoid, amyloid, hyaline, caseous, calcareous or osseous degeneration.

Diagnosis.—The diagnosis is based on the clinical history and on a careful physical examination by palpation, percussion and auscultation, and lastly by making an exploratory incision, obtaining a piece of the tissue and examining it under the microscope.

Prognosis.—The prognosis depends upon the type of the tumor; it is good in the benign, but bad in the malignant type. Upon the anatomical location, if easily removed it is better than if it is not accessible to the surgeon's knife, and lastly it depends on the general health of the patient.

Treatment.—*Medical.*—There is not a single case on record where a true tumor has been benefited by either external or internal administration of drugs, but if the swelling be from inflammation or syphilis, it will be benefited, therefore if arsenic or mercury lessens the size of a tumor, you have made a mistake in your diagnosis. The only application of medicines in tumors, are tonics to build up the general health. *Surgical.*—This consist of the radical extirpation of the growth, cleanly and completely. Some tumors are so situated as to give no pain or discomfort and can be let alone; others do not endanger life, but must be removed on account of the disfigurement the cause. Remove all tumors if possible with the knife, always cutting through healthy tissue, but if this is impossible use the thermo-cautery, constriction or escharotics.

Palliative.—This is the treatment applied to malignant tumors, which are either not accessible to the surgeon's knife or have passed the pale of surgery. The treatment consist of good food, tonics, stimulants and anodynes. If you have a patient with a carcinoma, and you know at the best he can't live very long, make him an

habitual opium eater, and so make him live the rest of his life in peace and comfort. Commence with small doses and increase the dose gradually until he can take as much as 8 grains a day. Never start to using the hypodermic syringe, as he will worry you to death sending for you to give him an injection. Don't give the opium in pills or camphor, as it will soon upset the stomach, but write for the following:

℞

Morphine Sulph.	grs viii
Ess. Pepsin (Fairchild's)	℥iv

M. Sig: As indicated.

LECTURE XLIV.

BENIGN TUMORS.

Fibromata or fibrous tumors are composed of fibrous tissue. On section, they are smooth, firm, glistening and of a grayish white color. They occur wherever fibrous tissue is found in any of its forms, but the most frequent seat is the periosteum. Fibromata are oval, hard, nodulated and of uniform consistency; they grow slowly, give little pain and are freely movable. They should be removed as soon as discovered, and if enucleation is complete, there is no danger of recurrence.

Lipomata or fatty tumors are composed of adipose tissue identical with normal fat. They have a thin capsule, which is attached by fibrous septa to adjacent tissue. They are found commonly on the shoulders, back and buttocks. Lipomata are circumscribed, painless, soft, inelastic mass. They grow slowly, but sometimes attain considerable size. If the edge is pressed upon by the finger it slips away. They should be treated by making a free incision, and shelling the tumor out of its capsule.

Chondromata or cartilagenous tumors are composed of some variety of cartilage. On section they are homogenous, translucent

and pinkish gray in color. They are usually composed of hyaline or fibro-cartilage. They occur commonly near the epiphysis of the long bones, and are sometimes seen in the testicles and parotid gland. Chondromata are hard, elastic, slowly enlarging growths, often nodular or lobulated and give little pain. Their treatment consist in the complete removal with the knife and periosteal lifter.

Osteomata or osseous tumors are composed of true bone, and are generally formed entirely of either cancellous or compact tissue. The cancellous type is usually found near the epiphysis of long bones, and may result from ossification of a chondromata. The compact type is usually found projecting from one of the cranial bones, and often is of an ivory hardness, and exceeding difficult to cut away. Osteomata are always connected with bone, and are hard and immovable. They are either pedunculated or have irregular nodular surfaces. They should only be removed when they give rise to pain or are steadily growing.

Odontomata or tooth tumors are composed of a mixture of dentine, enamel and cementum. They occur in the dental arch, and are the result of the "*misdirected energy of a tooth germ.*" Odontomata are dense in structure, irregular in shape and rarely exceed a normal tooth in size. They may project through the gum along with the teeth, or they may remain embedded in the substance of the alveolus. When diagnosed, they should be removed with forceps or chiseled out with bone instruments.

Myxomata or mucous tumors are composed of jelly resembling the vitreous humor of the eye. They are soft, gelatinous, semi-translucent and enveloped in a capsule. They occur commonly in the nasal cavity and are sometimes seen in the mammary gland, intermuscular spaces and sub-mucous and sub serous surfaces. They grow slowly and may reach a large size. They should be removed when practicable.

Myomata or muscular tumors are composed of muscle tissue. Rarely these growths are formed of striated cells; commonly they are composed of the non-striated variety. They occur frequently in the uterus and prostrate gland. Myomata are firm, sometimes smooth, but more often nodular, and on being cut presents an appearance closely resembling a fibromata. The tumor is intrinsically innocent, but sometimes mechanically interferes with the function of an organ, and then demands removal.

Papillomata or warty tumors are composed of epithelial and connective tissue, and resemble in structure hypertrophied papilla of the skin or mucous membrane. They occur most frequently on the hands and genital organs, owing to the exposure of these regions to dirt and irritation. Papillomata may appear as small cauliflower masses, or as flattened elevations, or as villous tumors. These growths, while innocent, often degenerate into epitheliomata, and hence should be removed by either the knife or caustics.

Angeiomata or blood vessel tumors are composed of newly formed and old dilated blood vessels. They form swellings of different shapes and sizes, all characterized however, by being bright or dark red in color, soft and compressible in consistency.

The treatment of angeiomata consists in their extirpation with the knife, ecrasseur or themo-cautery.

Lyphangeiomata or lymph vessels tumors correspond to the angeiomata of the blood vessels, and consist essentially of dilated and hypertrophied lymph vessels. The tumors sometimes reach a considerable size, and are filled with a fluid which usually is clear, but sometimes milky. The treatment consists of excision and when this is considered hazardous, the growth may be destroyed by splitting it open, and packing with iodoform gauze.

Neuromata or nerve tumors are composed essentially of new formed nerve fibre. It is necessary to draw a distinction between true and false neuromata. A false neuromata consists in a growth of fibrous or muscular tissue on a nerve trunk or terminal, which displaces or destroys its fibre; as an example, may be cited the so-called amputation neuromata. The true neuromata consist of newly formed nerve fibres. Neuromata are innocent growths, but often cause great pain. The treatment consists in extirpation, and if this necessitated the division of a nerve trunk, the subsequent restitution of continuity by a plastic operation.

Lymphomata or tumors of lymphatic glands arise from pre existing lymphatic glands, and are usually seen on the neck or in the axilla. They are disfiguring, and while, innocent in nature, may cause danger mechanically. They should be removed by free dissection.

Adenomata or glandular tumors are composed of acinous or tubular glandular tissue mixed with connective tissue in varying

proportions. Adenomata are innocent growths and give little pain. The acinous variety occurs in the mammary, ovary, tests and other glands. The tubular in the intestines; especially the rectum. The treatment consists in early excision.

Cystomata or cystic tumors are growths whose walls are produced from a matrix of embryonal cells, and whose contents are the products of the cells lining the cyst wall. This definition restricts the term cystomata to neoplasms or new growths, and does not include the class of swellings due to the retention in a preformed space of physiological secretions or excretions from the obstruction to the outlet of a gland. The wall of a cystomata is formed by proliferation of cells, and the contents of the cyst is a substance produced by the cells of the cyst wall. A cystomata grows rapidly, and may cause considerable pain. Its density depends upon the tension to which the wall is subjected by its contents. It may be soft and fluctuating, it may be so firm as to impart the sensation of solidity. Their most frequent seat is the neck and abdominal region. Cystomata are benign growths, but cause trouble from pressure. They should be early and completely removed.

Teratomata are tumors composed of tissues which do not normally exist at the place where the tumor grows. The highest type of a Teratomata is where an organ or set of organs develop.

The simpler variety is composed of heterogeneous tissue, such as bone, teeth, hair and skin. Teratomata are usually located in the ovary, but they may develop at almost any part of the body. It is impossible to make a diagnosis until an exploratory incision is made. They should be removed.

LECTURE XLV.

MALIGNANT TUMORS.

SARCOMATA. A sarcomata is a malignant tumor composed of embryonal connective tissue, and may exist wherever normal connective tissue is found. Their characteristics are those of all malignant neoplasm; it is not encapsulated, are plentifully supplied with blood, grows rapidly, causes great pain, infiltrates adjacent tissue, and when removed they tend to recur.

Structure.—A sarcomata is formed of connective tissue cells embedded in a homogeneous matrix. It has no stroma or connective tissue trabeculae, but is held together by an amalgam or cement substance which binds the cells together and separates one from the other. The solidity of the tumor depends on the amount of the cement substance. (A carcinomata has trabeculae and fascia to hold the cells together but has no intercellular cement substance.) A sarcomata contains a bountiful supply of blood vessels, which run between the cells in the cement substance. Their walls are thin and imperfect, sometimes only consisting of a mere channel in the cement substance. SARCOMATA CONTAIN NO LYMPHATICS.

VARIETIES. There are three varieties, the difference being based on the variety of cells they contain.

(1) *Round cell Sarcomata.*—This tumor is composed of round cells, the result of the proliferation of embryonal connective tissue cells. They are about the size of a white blood corpuscle, contains one or two nuclei and are held together by a intercellular cement substance forming a fluctuating mass. This is a rapidly growing tumor and is very malignant. Their most frequent site is in the periosteum of bones, but are also found in fascia, submucous tissue, mammary gland, ovary, &c.

(2) *Spindle cell sarcomata.*—This is a little higher type, the connective tissue cells being more mature. It is formed of spindle shaped connective tissue cells, resembling very much bearded oats, with sprangled ends. They are laid side by side their ends interlacing and are bound together by a sticky gelatinous cement sub-

stance which is less in proportion than found in the round cell variety, and the tumor is therefore harder and denser than the first variety. They are found in the mammary gland, ovary, uterus, testes, and sometimes in the prostate gland.

(3) *Giant cell sarcomata.*—This variety is not formed entirely of giant cells, but a mixture of round cells, spindle cells and giant cells, but receives the name of the most characteristic type, which is the giant cells. These cells are a hundred times as large as a white blood corpuscle, contains granular protoplasm, and has about fifteen to twenty nuclei which are arranged around the periphery of the cells. The cells are bound together by an intercellular cement substance. They are only met with in bones, the most common seat being the medullary cavity. They grow slowly, causes considerable pain, and can be diagnosed by the bulging of the bone.

Pathology. How do these tumors grow, start and progress? They begin to grow the moment the ilet of deposit of dormant embryonal cells are stimulated, which causes the cells to proliferate. The cells rapidly divide but none of them ever reach maturity. They do not push the cells in which they grow aside, as in a benign tumor, but infiltrates and penetrates them. Then there is a gradual dissemination of the growth and colonies form on different portions of the body. This is accomplished by some few of the sarcomatous cells entering a vein and are carried to every portion of the body and form new growths. There is no dissemination through the lymphatics, as these tumors contain no lymph vessels, but are bountifully supplied with blood vessels. These tumors on account of their rapid formation, poor development, are liable to degenerative changes; such as fibrous, osseous or calcareous degeneration.

Symptoms.—These vary with the variety of the sarcomata and the location. There is in all the types pain, swelling and deformity. If the tumor is seated in the liver, its function is interfered with; if in the brain, there is imbecility, &c.

Diagnosis.—The diagnosis depends, 1st, on the age of the patient; sarcomata rarely forming after the 35th or 40th year. 2nd, on its consistency, there are usually cystic cavities in the interior which makes it unequally hard to the touch. 3d, They are differentiated from a benign tumor by the fact that they develop

rapidly; and from the carcinomata by not involving the neighboring glands.

Prognosis —The prognosis depends on the type; the round cell sarcomata is more malignant than a spindle cell sarcomata, and the spindle cell sarcomata is more malignant than the giant cell sarcomata. It also depends on the anatomical location of the tumor; if it is in brain or stomach the prognosis is grave, but if it is situated on the periosteum, hand or foot, where it is accessible to the surgeon's knife, the prognosis is better.

Treatment.—The treatment consist in the immediate and absolute removal of the growth. If a man comes to you with a sarcomata on his hand, and it is yet in its incipiency, cut off the arm; if on his foot, cut off leg; if on the breast of a woman, extirpate the gland, and if it is on the uterus, perform a hysterectomy. If the patient does not come under your care until general dissemination has occurred, don't operate, it is too late. Although eminent surgeons claim that the Toxins of the germ of Erysipelas does not affect sarcomata; you can try them on the hopeless cases as a last resort.

Carcinomata or Cancer.—This is a malignant neoplasm or tumor formed from embryonal epithelial cells, and having clam-like prolongations extending from its margins into the adjacent healthy tissue. It has all of the characteristics of a malignant tumor; it has no capsule, has a bountiful blood supply, grows rapidly, causes great pain, infiltrates adjacent tissue, involves neighboring glands and tends to recur when removed.

Structure.—It is composed essentially of epithelial cells held together by trabeculae or stroma. It contains no intercellular cement substance and is held together only by the trabeculae or stroma. The stroma is composed of connective tissue which intersects and divides the growth into small apartments. Each apartment is filled with epithelial cells, which are so concentrically arranged that they are said to have a nest-like appearance. The tumor is richly supplied with blood vessels and lymphatics and as they pass by each apartment of cells, a twig is given off to them.

Pathology.—A carcinomata or cancer begins in individuals who have formed in embryonal life, more epithelial cells than were necessary to build up the foetus. These superflous cells lay dormant until stimulated, when they divide rapidly, each beget-

ting a child after its own kind and a tumor is formed. These cells do not push aside the adjacent tissue, but permeates and infiltrates it. Cancer like a sarcomata tends to form colonies in various portions of the body, but the disease is not disseminated through the blood vessels as in sarcomata, but by the lymphatics. When the disease commences to disseminate the lymphatics and also their glands become hard, gland after gland is conquered until the general lymph circulation is reached; the diseased cells then pass through the heart and is disseminated through the body, when general infection occurs.

Varieties.—There are two broad classes; Epithelial cell carcimata and Spheroidal cell carcinomata. Epithelial cells occur normally either as a squamous or a columnar, and cancerous growths always possess one of these types of cells. They are squamous cells when they come from the skin, and spheroidal when they come from a gland, and this being the case, the microscope will tell you where the cells came from. (1) *Epithelial cell carcinomata.*—This type is composed of squamous epithelial cells, held together and divided off into apartments by a stroma of connective tissue. It develops usually at the junction of the skin and mucous membrane; as on the alae of the nose, corner of the eye, lips, penis, &c., but it also occurs in other localities, but more frequently in the places named above. (2) *Spheroidal cell carcinomata* or columnar cell carcinomata is that variety of cancer which forms in glands and whose cells are spheroidal or columnar shaped and divided off into apartments, and held together by a stroma of connective tissue. They occur in the mammary gland, ovary, uterus, liver, pancreas, kidney, spleen, testes, and sometimes in the prostate gland.

Symptoms.—The symptoms depend on the location of the tumor. There is always pain and deformity and the other symptoms depend on the anatomical seat of the disease. Besides the local symptoms, there are general symptoms spoken of as Cancerous cachexia. The patient has a peculiar appearance, which consist of a pale white hue of the skin. It is not like the appearance of a malarial or anemic person, but the skin is drawn, eyes sunken and gives the appearance of a being drawn downward. There is also anemia and loss of strength and tissue, which is not only due to pain, but also to the absorption of the specific toxins.

Diagnosis.—The diagnosis is based on the age, carcinomata rarely occur under forty years of age; on the tumor sending out prolongations into the adjacent tissue, and it is diagnosed from sarcomata by the lymphatic glands being involved.

Prognosis.—The prognosis depends on the variety, the epithelial cell carcinomata being more easily eradicated than the spheroidal; upon the seat of the tumor, if on the nose or lip, or any place of easy access to the surgeon's knife, the prognosis is better than if it is seated in the uterus or liver. No matter how often and how completely removed, this class of tumor always tends to recur. Statistics show that after complete excision, 75 per cent. of the operations are not permanently successful. The important point is to remove the tumor before glandular enlargement has taken place, with general dissemination.

Treatment.—Extirpate the tumor as early as possible. Remove the organ involved if possible, and if accessible, remove the diseased lymphatic glands. You must operate in all cases of cancer, not with the view of curing the patient, but it always does good by stopping the pain, life is prolonged and hope restored.

LECTURE XLVI.

RETENTION CYSTS.

A Rerention Cyst is an enlargement due to the retention of a normal secretion or excretion in a performed space, the retention being caused by the obstruction of the duct by which the secretions or excretions normally escape. For example: one of the ureters may become obstructed, and a retention cyst will form in the pelvis of the kidney or even in the substance of the gland itself. The term Retention cyst is vaguely used and is often confounded with Cystomata; but a cystomata is a tumor formed from the proliferation of embryonal cells, the cyst wall and contents are freshly built; whereas in a retention cyst, the walls pre-existed

and the only abnormality is the obstruction of the duct with consequent retention of normal excretions or secretions.

Structure.—It consists of a cyst wall and cyst contents. The wall is the duct or the gland itself; for instance, if the obstruction is at the hilum of the kidney, the kidney and its capsule would form the cyst wall; but if the obstruction was in the ureter near the bladder, the wall of the ureter would form the cyst wall. When a cyst commences to grow, its walls are thick, but from pressure they become as thin as paper or the wall may be thin, and from irritation becomes thickened. The walls of a cyst are gradually reduced to simple connective tissue, the glandular tissue being absorbed. The cyst contents consists primarily of the secretions or excretions of the gland in which it is formed, but as the cyst grows, various changes occur which so alters its appearance that it will not be recognized as a normal fluid; inflammation and suppuration may occur, when it will be mixed with pus or some blood vessel will rupture and pour its contents into the cyst and so disguise its contents.

Causes.—The causes are numerous, but the most frequent are inflammation or some mechanical obstruction. For instance, some large gland secreting from one to twenty pints a day through a fine capillary duct which becomes obstructed; on examination you will find the adjacent tissues inflamed, causing obstruction to the duct or it is being pressed on by a tumor.

Varieties.—Retention cysts may occur in almost any portion of the body, but the following situations are the more frequent sites. (1) Skin; they occur on the skin in one or two types, Sebaceous or Sudoriferous cyst depending upon whether the duct of a sebaceous or sweat gland is obstructed. Sebaceous cyst are usually situated on the scalp, but may occur on any portion of the body. When incised they shell out readily. The treatment consist of rendering the part aseptic, incising the lump, grasp the sack with forceps and shell it out; stop the bleeding, take one or two stitches and dress the wound. Sometimes inflammation has occurred causing adhesion to form, and the sack will have to be dissected out, for if it remains the cyst will recur. (2) Mucous membrane; retention cysts sometimes form on mucous membranes. There are in all mucous surfaces, mucous crypts whose functions is to

secrete mucous which lubricates the surface. If the mouth of these crypts become occluded a retention cyst forms. The treatment consist of a free incision and the removal of the capsule. Remember in the treatment of all cyst, that it does no good to incise the enlargement and allow the capsule to remain; and if you find the capsule so adherent as to be impossible to be dissected out, destroy it by curetting and packing with iodoform gauze, which should remain until the pressure has destroyed the capsule. (3) Fallopian tubes; these tubes are open at both extremities, and if one or both ends become occluded a retention cyst forms. The usual cause is gonorrhea, but it may be produced by a more innocent cause. If the contents of the cyst is composed mostly of water, it is called Hydrosalpinx, and if it contains pus, it is called Pyosalpinx. The fallopian tube, though normally very small; is distended until it looks like a saucer. (4) Appendix: the opening into the appendix, situated at its junction with the caecum, sometimes becomes occluded, mucus accumulates and suppuration may occur, but the trouble was originally a retention cyst. (5) Ovary: a graafian follicle reaching maturity fails to rupture, its secretions and excretions can't escape, distention occurs and the follicle is transformed into a retention cyst, which may reach an enormous size. (6) Testicles: there is a possibility of the duct of these glands becoming occluded, with consequent accumulation of its secretions and a retention cyst is formed. (7) Gall tract: the gall duct, common duct or cystic duct, from inflammation, pressure of a tumor or impaction of a calculus, will cause the bile to be retained, and although some of it will be reabsorbed, a retention cyst forms. (8) Kidney: the ureters may become obstructed by a calculus, inflammation, pressure of a tumor, or by the ligature of a careless surgeon, and the urine being unable to escape is retained, constituting a disease known as Hydronephrosis. The cyst may contain a gallon of urine. These cysts are also sometimes seen in the Pancreas, Thyroid gland, Mammary and Salivary glands, due to obstruction of their ducts.

Symptoms.—The first symptom is swelling or increase in bulk, which is also common to hypertrophy and other troubles. The general symptoms depend on the organ involved; if it is in the

salivary gland, the symptoms are practically "nil," but if it is in the gall tract, there will be jaundice, profuse vomiting, &c., and if in the kidney, there will be pain, tenderness, scant urine and swelling.

Diagnosis. —The diagnosis is based on the clinical history, careful physical examination by palption, percussion and auscultation and can be confirmed by the aspirator.

Prognosis.—The prognosis is based on the organ involved , and on the complications. A sebaceous cyst amounts to nothing, but if it is a cyst of the kidney, the prognosis is bad, especially when complicated by suppuration with a low grade of septicenia or Pyaemia.

Treatment.—The proper treatment, if it is possible to do so, is to remove the obstruction. If there is a cyst of the gall bladder due to pressure from a tumor, remove the tumor, or if in the kidney, due to the obstruction of the ureter by a calculus, remove the calculus. If you can't remove the obstruction, the next best treatment, is to make an artificial fistula. For instance: if there is obstruction to the urethrae and you can't remove the obstruction, make an artificial urethrae; if he is suffering from Hydronephrosis, make an artificial fistula, and the rest given the ducts by these fistula, frequently return them to their normal condition. If you find none of the above pracitcable, excise the whole business; if it is a sebaceous cyst, remove the whole gland; if it is Hydronephrosis, remove the kidney.

LECTURE XLVII.

ASEPTIC AND ANTISEPTIC SURGERY.

ITS ORGANIZATION AND DETAILS OF PREPARATION.

Peparation of the patient.—The patient should be under observation for some days before the operation, and, if possible, confined to bed for the last day or two, thus allowing the various organs to accustom themselves to the new conditions in which they will be placed. The function of the skin, kidneys and bowels should be stimulated, if sluggish from improper habits of living, the heart carefully examined to determine the safety of the anaesthetic, and the urine analyzed to ascertain the condition of the organs which excrete it. A warm plunge bath should be given daily, and also an antiseptic vaginal douche, if the patient be a woman. The diet should be simple and nutritious, and of a character to leave little residual matter in the intestines. The bowels should be evacuated daily, and a purgative given the night before the operation, followed by a simple enema the next morning. A large dose of quinine should be given, as clinical experience has shown that its influence lessens surgical shock.

The morning of the operation a general bath should be given with warm water and soap, and the part to be operated upon cleanly shaved. The area should be well scrubbed with hot water and green soap, washed with alcohol, then with a 1:1000 solution of bichloride of mercury, and finally a dressing of bichloride gauze applied, and retained in place by a bandage or binder. The patient should be dressed in a fresh suit of merino under clothing, woollen socks or stockings, a night-gown, and a warm wrapper.

No food should be given some hours before taking the anaesthetic, and immediately before the operation the bladder should be emptied.

Preparation of Operating Room.—Nothing need be said under this head with reference to hospital work, as all connected with these institutions are thoroughly familiar with the details.

Nearly all large hospitals have an operating room specially arranged for surgical work, and patients are taken to this room, operated upon, and then carried back to their beds in the private rooms or wards of the buildings. In operating in a private house, however, it will be found easier to operate in the room in which the patient is to be placed during convalescence, as it entails less inconvenience in the household, and lessens the work of preparation.

The room selected should be moderately large, well-lighted, and easily ventilated and heated. The carpet should be taken up, and the curtains, pictures and unnecessary furniture removed.

The walls should be brushed down, and the floor, frames of the doors and windows, and wood-work of the furniture washed with 1:1000 solution of bichloride of mercury.

The furniture should consist only of a bed, two chairs, an operating table, and four small tables.

The bed should be a single one, preferably of iron, and should have a good spring and a firm hair mattress. It should be placed so as to be accessible from both sides and the foot.

The chairs should be stiff ones, not rockers, and of wood, so they can be washed without injury.

The operating table should be firm and of a suitable size and shape. A pine table, such as is commonly found in the kitchen, or two small tables placed end to end, will answer. The operating table should be placed opposite the window which admits the best light, and the lower panes of the window screened by tacking a piece of muslin or a towel across them. On the table should be placed a folded blanket and a pillow, and over these a rubber protective and a sterilized sheet.

The four small tables should be covered with sterilized sheets or towels. One should be placed at some distance from the operating table, and contain the basins and solution used in sterilizing the hands. One to the right of the first assistant for the sponge basins, one to the right of the operator for the instruments and dressings, and one behind the operator for the basin of pure water in which to wash his hands during the operation.

Arrangements of the Patient.—It is important to prevent the patient being chilled during the operation, as it increases shock

and retards reaction. Care should be taken to keep the temperature of the room uniform, to avoid draughts, to make no unnecessary exposure of the body, and to prevent wetting.

If the site of the operation permits, the patient's limbs should be closely wrapped in a blanket, and the chest protected by a folded piece of flannel. Hot water bags may be placed at the patient's feet. The limbs should be secured by passing a bandage over them just above the knees, and tying tightly under the table. The arms should be confined to the sides by twisting one end of a sterilized towel around the hand and wrist and thrusting the other end under the patient's hip. Rubber pads or sheets should be adjusted so as to prevent the various solutions employed from saturating the patient's clothing and bedding. The protective dressing should be then removed from the seat of operation, and the surface again washed successively with alcohol, 1:1000 solution of bichloride of mercury and sterilized water. The part should be covered with a large piece of aseptic gauze having a slit cut in it large enough through which to work.

Preparation of Operator and Assistants.—Before beginning a serious operation, the operator and his assistants should take a full bath, and put on an entirely fresh suit of clothing. Their heads should be protected by linen caps, and their bodies by linen gowns or sheet aprons. Their arms should be bare to the elbow and their hands carefully sterilized.

Duties of Assistants.—As delays in an operation are not only annoying to the surgeon, but dangerous to the patient, it is important for assistants to be well drilled, and to know exactly what they are expected to do.

The number of assistants and their duties varies with different operators, and with the same operator under different circumstances. The following is a convenient division of the work:

The Anæsthetizer stands at the headof the table. His duty consists solely in the administration of the anæsthetic, which requires his individual attention.

The First Assistant stands on the left side of the table opposite the surgeon. He sponges the wound, catches bleeding vessels, and assists the operator in every way possible. He should endeavor to anticipate the needs of the surgeon, and direct the

other assistants in their work, thus saving the operator time and trouble.

The Instrument Assistant stands to the right of the surgeon at the side of the table which contains the instruments and dressings. He hands instruments to the operator, supplies the first assistant with ligatures, and threads needles with the required material, as they are needed. As soon as an instrument has been used, he washes it in sterilized water, and returns it to its place in the trays.

He should keep an accurate list of the instruments in solution, to be certain that none are lost. It is also his duty to cut the dressings in the desired shape, and if their application devolves on the first assistant, to assist him, taking the place at the side of the operating table vacated by the surgeon.

The Sponge Nurse stands behind and to the right of the first assistant, at the side of the table on which are placed the basins for the sponges. The basins should be two in number, one containing cold, and the other warm sterilized water. The first assistant, after using a sponge, throws it into the basin of cold water, the nurse frees it thoroughly from blood, and places it in the basin of warm water, from which she takes it, squeezes it dry, and hands it to the first assistant when needed.

Sponges should be washed first in cold water, because it does not coagulate the fibrin of the blood, and thus prevent its removal. They should then be placed in warm water to elevate their temperature, and to prevent their chilling the tissues to which they are applied, and lowering their vitality.

The nurse should make a written record of the number of sponges in her charge; and if this number is increased during the operation, either by the addition of new sponges or by the division of one already in use, the record should be corrected. At the close of the operation, she should count the sponges aloud, thus assuring the surgeon that none have been left in the wound or abdominal cavity.

Extra Assistant. —The assistants just named are not allowed to touch anything which has not been sterilized—hence it is necessary to have an extra assistant to alter the position of the patient on the table, to assist the anæsthetizer if the patient vomits, to

empty and refill basins, to open and close the windows and doors, and to do the many little things which, if done by one of the other assistants, would necessitate the re-sterilization of their hands and thus delay the operation.

After-Care of the Patient.—Unless complications occur, the management of the patient after an operation is simple. After the patient is put in bed, a nurse should remain at the bedside until the effects of the anæsthetic wear off. If there is much shock, it should be combatted by appropriate remedies. Nausea is usually a troublesome symptom, but should be treated tentatively. Anything in the stomach aggravates the trouble, and hence little or no water should be given. A cloth wrung out of ice-cold water placed on the forehead, or a mustard plaster on the abdomen, does good. The dressings should be frequently examined to see if there is any indication of secondary hemorrhage. Food at first should be given sparingly. It should be of a liquid form, concentrated, nutritious, and easily digested. The bowels should be moved on the second day. Unless drainage has been used, the dressings should not be disturbed for a week or ten days. The three indications for changing the dressings at an earlier date are: Pain, fever, and saturation of the dressings with secretions from the wound. In dressing a wound, the same care should be exercised to prevent its infection as was originally observed at the time of the operation.

Preparation of Water.—An abundance of both hot and cold water for irrigating the wound and cleansing the hands, instruments, and sponges, is essential in an operation. Water should be free from both inorganic and organic matter, as the presence of inorganic matter acts as a mechanical irritant, and the existence of organic matter vitiates asepsis by the introduction of bacteria. The inorganic, or mineral constituents, can be removed by either distillation or filtration, and the organic, or bacterial element, by boiling. The method of purifying water, therefore, embraces two processes—

1st. The water should be filtered or distilled.

2d. It should be boiled in a clean vessel for at least ten minutes.

A portion of the water should be allowed to cool, so that during the operation the temperature of the hot water can be lowered by

adding cold water to it. Nurses sometimes cool water by putting in a lump of ice, under the mistaken impression that the freezing process has destroyed all germ-life, and that hence the water resulting from the melting ice is sterile. It is as important for the cold water to have been boiled as it is for the hot, and hot sterilized water should never be cooled by the addition of cold water which has not been so treated. If sufficient time is not available to allow the water to cool, the process may be hastened by surrounding the receptacle with ice, but the ice should not come in actual contact with the water.

Preparation of Solutions.—Solutions are used as disinfectants and to irrigate and clean wounds and cavities. The following are the methods of preparing those most commonly in use.

Pure Water is prepared by filtering or distilling water, then boiling for ten minutes, and allowing it to cool to the desired temperature.

Normal Salt Solution is prepared by adding a drachm and a half of chloride of sodium, sterilized by heat, to two pints of pure water, filtering through filter paper, boiling, and allowing it to cool.

Thiersch's Solution is prepared by dissolving two parts of salicylic acid and twelve parts boracic acid in one thousand parts of water, filtering, boiling, and allowing to cool.

Bichloride Solution is prepared by dissolving in a given quantity of distilled water the number of tablets of bichloride of mercury that are specified on the bottle by the manufacturer to make the requisite strength.

Carbolic Solution is prepared by adding carbolic acid to water. The strength usually used is 3 per cent., and the solution can approximately be made by adding four drachms of carbolic acid to one pint of sterilized water.

Hands.—The hands of the operator and assistants are the most frequent source of wound infection—hence, great care should be taken in their sterilization.

In sterilizing the hands, the arms should be bare to the elbow, the skin free from abrasions, the finger-nails closely trimmed and well cleaned, and rings, if worn, removed.

The following is an effective process:

1st. Wash the hands with warm water and green soap, to remove dirt. A nail-brush should be vigorously used, to render the process thorough, and special attention devoted to the finger-nails and tissues around them.

2d. Rinse all trace of soap from the hands, and immerse them in absolute alcohol for one minute.

3d. Soak them for the same length of time in a warm 1:1000 solution of bichloride of mercury.

4th. Finally, wash them in one or two sterilized waters, to remove the bichloride, and dry them on an aseptic towel.

It is as important for the hands of an assistant, who handles sponges, instruments, or dressings, to be as clean as the operator's, and they should receive the same careful attention. If, during the course of an operation, the surgeon, or an assistant, touches any object which is not aseptic, his hands should be scrubbed and disinfected anew.

Instruments.—Instruments should be simple in construction, and readily taken apart, to facilitate cleaning. The instruments selected for an operation should be cleaned by washing with green soap and warm water, a nail-brush being used on the locks and serrated parts, such as the jaws of artery forceps. The blades of the knives should then be wrapped in cotton to prevent their being dulled, and the needles stuck in a piece of gauze to keep them from being lost, and the instruments wrapped in a towel. The bundle should be tied with a bandage, or fastened with safety pins, and disinfected by being placed in a sterilizer and steamed for forty minutes. After the administration of the anæsthetic has been commenced, the package should be opened, and the instruments slid into trays containing sterilized water.

An equally effective though more troublesome plan is to place the instruments in a 1 per cent. solution of carbonate of soda, and boil for ten minutes. The soda is a germicide and also prevents rusting.

In minor operations, it is frequently thought sufficient to place the instruments in a tray containing a 5 per cent. solution of carbolic acid for fifteen minutes and then pour off the solution and refill the tray with sterilized water.

If an instrument is dropped on the floor during an operation, it should not be used until disinfected again.

When an operation is over, the instruments should be well washed, carefully dried, and returned to their cases.

Sponges.—During the first craze for asepsis, sponges were almost abandoned, and pledgets of cotton or wads of gauze used in their place. These artificial substitutes proved unsatisfactory, and it was found that with care sponges could be rendered perfectly sterile, they again returned to favor. Some surgeons even now throw a sponge away after using it in one case, doubting the power of germicides to destroy the micro-organisms with which it may have become infected, but it is illogical to suppose that if the sponge, which was once filled with decomposing matter, can ever be rendered aseptic, that the process cannot be repeated. Sponges can be used and resterilized many times with safety, the only limit being the resistance of their tissue to the action of the solutions used. When the sponge becomes soft and friable from the effect of an antiseptic or bleaching fluid, it shoid be destroyed.

If sponges could be boiled then sterilization would be much simplified, but very hot water causes them to shrink, to lose their elasticity, and to become darker in color; hence, they should never be put in a solution warmer than can be comfortably borne by the hand. The following is one of the best methods to sterilize new sponges:

1st. Put the sponges in a bag and beat them well to remove sand.

2d. Wash them several times with warm water and green soap to remove dirt, and adulterants sometimes put in by dealers to render them more saleable.

3d. Soak them for twenty-four hours in a 2 per cent. solution of hydrochloric acid to dissolve calcaeous matter.

4th. Wash them in plain water until the acid is removed, which can be determined by testing with blue litmus paper.

5th. Put them in a saturated solution of permanganate of potassium, and allow them to remain until stained a mahogany brown. Then rinse in sterilized water. It must be remembered that the strength of the solution deteriorates after a number of sponges have been through it, and that fresh permanganate has to be added from time to time to keep it up to the standard. When this is done the sponges should be taken out of the liquid,

the permanganate dissolved, and the sponges put back, for if the drug is put in on the sponges it discolors them in spots.

6th. After the sponges have been freed from an excess of permanganate they should be placed in a saturated solution of oxalic acid until bleached. Care should be taken to remove them as soon as they are white, as a prolonged bath in the bleaching fluid softens their fibre. Additions of oxalic acid have to be made to the solution at intervals to keep it up to the standard.

7th. Put them in a 1:1000 solution of bichloride of mercury for one hour.

8th. Finally wash them in repeated baths of sterilized water to remove all trace of the chemicals previously employed.

It is almost as easy to prepare several hundred sponges as it is to prepare a dozen, and in hospitals it is customary to sterilize a large number at one time. When this is done, and the process just described is completed, the sponges are placed in large glass-covered jars which are filled with a 3 per cent. aqueous solution of carbolic acid, to which a small proportion of glycerine is added to prevent the sponges from becoming blackened. Before each operation the required number of sponges are removed from the solution by a pair of aseptic forceps, and washed in sterilized water to remove the carbolic acid.

After sponges are used in an operation they should be well washed in cold water to free them from blood, dried, and put into a bag. When they accumulate in sufficient numbers they are again sterilized.

To sterilize sponges which have been used they should be soaked in a saturated solution of baking soda for twelve hours to remove all animal matter, rinsed plain water to remove the alkali, and then put in the solution of permanganate of potassium and afterwards treated by the method just described.

Basins, etc.—Irrigators, pitchers, basins and trays used in the operating room should be scrupulously clean. They should be made of some material which is not affected by solutions of corrosive sublimate, such as glass, rubber, porcelain or agateware.

Prior to the operation they should be washed with water and green soap, and filled with a 1:1000 solution of bichloride of mercury. Before using, the solution should be poured out and the utensils washed in sterilized water.

Operating-Room Linen.—The linen which requires sterilization for an operation consist of sheets, pillow-cases, towels and operating gowns. They should be placed in the sterilizer and subjected to high temperature for fory minutes before the operation, and removed as needed by an assistant whose hands have been rendered sterile. After the operation they should be soaked in a cold solution of baking soda to remove the blood, immersed for one hour in a 1,000 solution of bichloride of mercury, washed in plain water, and sent to the laundry.

Ligatures and Sutures.—Ligatures are made from a variety of materials, and sterilized by many different processes. The following are methods of preparing silk, cat-gut, and silk-worm gut:

Silk.—In hospitals silk is usually kept in a glass ligature box, which has several spools for the different sizes. The silk, when it comes from the dealer, is wound on the glass spools, and the spools containing the silk boiled in water for five minutes and returned to their places in the box The ligature box is then filled with equal parts of alcohol and water, to which is added enough carbolic acid to make a 5 per cent. solution. Three days before an operation the hands should be sterilized, and the required quantity of the different sizes of silk removed from the ligature box, and washed in several sterilized waters to remove the carbolic acid. It should then be wound on small glass spools, which are rendered aseptic by washing in a solution of bichloride, and the spools placed in a clean test tube, the end of which is tightly plugged with absorbent cotton. The tube, or ignition tube, as it is called, should be placed in the sterilizer for half an hour on three successive days and subjected to high temperature. The plug of cotton should not be removed until the silk is actually required for use.

Cat-Gut.—Cat-gut is exceedingly difficult to sterilize, as it contains a large proportion of fat, and is infected with germs from its very source, being made from the sub-mucosa of the intestines of sheep. The ready-prepared article found on the market is not trustworthy, and should not be used. Raw cat-gut should be soaked in ether for twenty-four hours to remove the fat. It should then be sterilized by boiling in alcohol. To do this effectually, the cat-gut should be wound on a glass reel, immersed in a

bottle filled with absolute alcohol, and the mouth of the bottle tightly plugged with absorbent cotton. The bottle should then be placed in a water-bath, care being taken that evaporation does not leave any part of the reel uncovered.

After the process has been completed, if it is desired to chromacize the cat-gut, and thus render it less absorbable, it can be done by placing it in a solution of one part chromic acid, 200 parts carbolic acid, and 4,000 parts distilled water, for forty-eight hours. Only a quantity of cat-gut equal in weight to the carbolic acid in the solution should be immersed, as a larger quantity would not be thoroughly chromacized, and a small quantity might be over-prepared. After being thus sterilized, or chromacized, cat-gut should be kept in absolute alcohol. When required for use, the quantity needed should be removed with surgically-clean hands, again boiled in alcohol, and placed in a tray containing a mixture of one part glycerine and nine parts alcohol, which gives the gut greater smoothness and pliability.

Silk-Worm Gut.—Silk-worm gut can be rendered sterile by boiling, by baking, or by immersing in solutions of carbolic acid, or bichloride of mercury. The following method is an excellent one: The ragged ends of the strands are clipped, and the bunch put in a 1 per cent. alcoholic solution of methylin blue, where they should remain for twenty-four hours. This stains them a dark violet, and renders them more easily seen. They are then rinsed in water and soaked in a 1:1000 bichloride of mercury solution for twenty-four hours. They should be kept in absolute alcohol until needed.

Drainage Material.—Drainage is usually effected by rubber tubing, glass tubes, strips of gauze, or strands of cat-gut.

Rubber drainage tubes should be prepared by first washing them well with soap and water and rinsing in clear water, then soaking for twenty-four hours in a 1:1000 solution of bichloride of mercury, and finally storing them in a glass jar containing a 5 per cent. solution of carbolic acid. Before using, the disinfectants should be removed by rinsing in boiled water.

Glass drainage tubes should be washed with soap and water, boiled for half an hour in a 1 per cent. solution of carbonate of soda, and kept in a 5 per cent. solution of carbolic acid. Rinse in pure water before using.

Gauze drains are strips of aseptic gauze one yard long and about an inch wide. They should be cut by the draw-thread method, thus preventing ravelling. The strips are made in little rolls, and placed in a tube, and sterilized in the manner described for the sterilization of silk. When required for use, the plug of cotton should be removed, and the strips handed to the surgeon by means of sterilized forceps.

Dressings—*Cotton.*—Reliable cotton can be purchased from dealers put up in cartoons. It may be well, however, to sterilize it again by baking in a hot-air oven for an hour before using.

Gauze.—Gauze can be purchased on the market, put up in hermetically-sealed jars, which is perfectly reliable. Except where very large quantities are used, it will be found more satisfactory, as well as economical, to use the preparation of some reliable manufacturer than to attempt its preparation.

The following are methods of making the varieties of gauze most commonly used:

Plain Aseptic Gauze.—Soak the cheese-cloth for one hour in a sud of soft soap and water to remove the "sizing," wash several times in clear water to free it from soap, and then steam in the sterilizer for an hour, and store in clean glass jars having well-fitting covers.

Bichloride Gauze.—Free the cloth from sizing and remove all traces of the soap, as in the previous process, and immerse it for several hours in a 1:1000 solution of bichloride of mercury, to which has been added a little glycerine. Then dry in the sterilizer and store in clean jars.

Carbolized Gauze is prepared in the same manner as bichloride gauze, except that a 5 per cent. solution of carbolic acid is used in place of the bichloride solution.

Iodoform Gauze is prepared by taking plain aseptic gauze and cutting it in three-yard lengths. Each length is placed in an emulsion composed of ten drachms of iodoform and six ounces of soapsuds—the suds being formed by the addition of castile soap to sterilized water. After thoroughly rubbing the emulsion into the meshes of the gauze, it is gently squeezed, sprinkled lightly with glycerine, and dried in a hot-air oven at a low temperature. It should then be stored in colored glass jars.

Rubber Tissue.—In dressing wounds strips or sheets, of rubber tissue will frequently be used. They should be sterilized by soaking in a solution of 1:1000 of bichloride of mercury for an hour, and then rinsed in boiled water.

Bandages.—Dressings are secured in place by bandages of cotton or flannel. They should be rendered aseptic by heating in the sterilizer for an hour before using.

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CATGUT!

Since this material was introduced into surgery by Lister, a vast amount of labor and thought has been expended in attempts to properly prepare it for use. The literature of this subject is very extensive. The methods and suggestions embrace every possible device for rendering it sterile, and recommend a vast list of antiseptics for its preservation.

Notwithstanding all this, reports have heretofore shown that none of the infinite number of processes were wholly satisfactory. Those processes that produced sterile ligatures made them brittle; methods that did not make the strings tender, left them infected. Finally, if by chance made aseptic, they were easily reinfected so that no one was really furnishing absolutely aseptic ligatures.

We have given attention to this vexing problem in our laboratories almost continuously for ten years—trying every conceivable plan—following every suggestion, working out every method. We venture to say that our experiments and researches have cost many times our profits upon tnis material. The difficulties to be overcome can be partially realized when we consider the nature of this gut (the intestines of sheep, twisted into hard cords). It is a gelatenous substance, often infected with the deadly Anthrax, and sometimes with germs even more resistant than those of Anthrax. It is impenetrable by most solutions, destroyed by heat, rotted by chemicals; and, worse than all, a substance that will gather germs in handling. It is a jelly-like thing, that in itself receives, holds and nourishes germ life; easy to infect, hard to disinfect.

At last we produced the Red Cross Aseptic Ligatures, that are as their name indicates—aseptic—free from germ life, protected from infection by handling, with their tensile strength and elasticity unimpaired. The processes by which this is accomplished have been published in detail. Their completeness consists in the fact that sterilization is accomplished by means of a series of operations by which the organic structure of the infecting bacteria is removed and their life destroyed without touching the strings by the hands. In brief, the Ligatures are sterilized while inside a protecting envelope that allows the sterilizing agents to penetrate, but prevents the operator from touching the gut. The Ligatures reach the surgeon in this same envelope (still further protected by an outer covering), then sealed in glass. These strings reach the wound (untouched save by the surgeon) direct from the sterilizer.

We are safe in saying no known system approaches that under which Red Cross Ligatures are sterilized and handled. Our claims for them have been verified by purposely infecting strings with the most resistant germs and passing them through the sterilizing processes. Thorough bacteroilogical tests have shown that the germs were wholly destroyed.

Further ample proofs have been given by exhaustive tests made by our surgical friends during the course of experiments, and by the fact that in the thousands of packages sent out since placing them upon the market, not one report has been made of the occurrence of infection from Red Cross Aseptic Ligatures. These Ligatures are put up in strings 30 inches long, each string in a double germ-proof envelope; 12 envelopes are put in a glass bottle and sealed. They therefore cannot become infected in their handling and sale by the dealer. One or more ligatures can be removed without endangering the remaining strings. If the inner envelope is opened with disinfected hands or forceps all possible danger is easily avoided. The important point is that they are rendered absolutely sterile in their treatment, and with a moderate amount of care will reach the surgeon in perfect condition. A sample of these Ligatures will be sent any surgeon on application.

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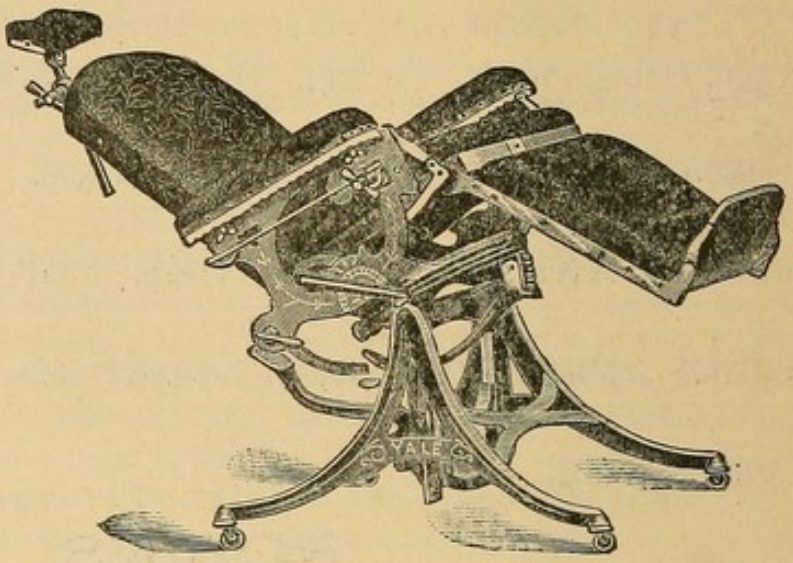

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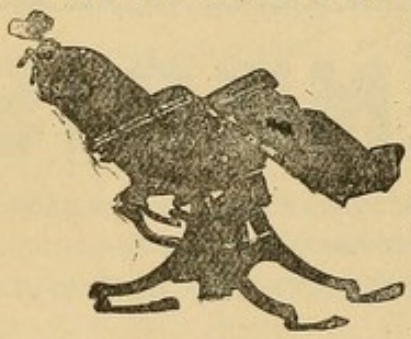

Fig. V.—Semi-Reclining.

1st. Raised by foot and lowered by automatic device.—Fig. I.
2d. Raising and lowering without revolving the upper part of the chair.—Fig VII.
3d. Obtaining height of 39½ inches.—Fig. VII.
4th. As strong in the highest, as when in the lowest position.—Fig. VII.
5th. Raised, lowered, tilted or rotated without disturbing patient.
6th. Heavy steel springs to balance the chair.
7th. Arm Rests not dependent on the back for support.—Fig. VII—always ready for use; pushed back when using stirrups—Fig. XVII—may be placed at and away from side of chair, forming a side table for Sim's position—Fig. XIII.
8th. Quickest and easiest operated and most substantially secured in positions.

9th. The leg and foot rests folded out of the operator's way at any time—Figs. XI, XV and XVII.
10th. Head Rest universal in adjustment, with a range of from 14 inches above seat to 12 inches above back of chair, furnishing a perfect support in Dorsal or Sim's position.—Figs. XIII and XV.
11th. Affording unlimited modifications of positions.
12th. Stability and firmness while being raised and rotated.
13th. Only successful Dorsal position *without moving patient.*
14th. Broad turntable upon which to rotate the chair, which cannot be bent or twisted.
15th. Stands upon its own merits and not upon the reputation of others.

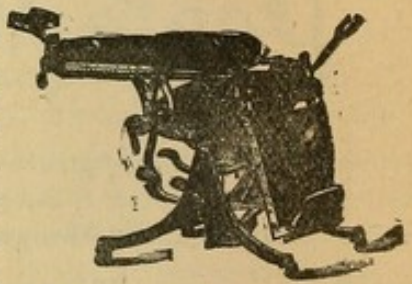

Fig. XVII—Dorsal Position.

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