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LOCAL ANÆSTHETICS

AND

COCAINE ANALGÆSIA;

THEIR USES AND LIMITATIONS.

BY

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NEW YORK,

MEMBER OF NEW YORK ACADEMY OF MEDICINE; THE NEW YORK PATHOLOGICAL SOCIETY; THE AMERICAN MEDICAL ASSOCIATION; THE NEW YORK STATE AND COUNTY ASSOCIATIONS; THE METROPOLITAN MEDICAL SOCIETY; VICE-PRESIDENT OF THE NATIONAL ASSOCIATION OF RAILWAY SURGEONS; VISITING SURGEON TO HARLEM HOSPITAL; CONSULTING SURGEON TO FORDHAM HOSPITAL, AND HOSPITAL FOR THE AGED, YONKERS.

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DEDICATION.

AS A VERY INADEQUATE RECOGNITION OF FAVORS BESTOWED AND MANY PRIVILEGES ENJOYED,

THIS SHORT, HURRIEDLY WRITTEN CONTRIBUTION

IS RESPECTFULLY DEDICATED

TO THE

NATIONAL ASSOCIATION OF RAILWAY SURGEONS;

WITH THE ARDENT HOPE

THAT THROUGH A FAITHFUL AND PERSEVERING APPLICATION OF THE PRINCIPLES HEREIN EMBODIED,

DIFFICULTIES AND DANGERS IN THE PERFORMANCE OF MANY SURGICAL OPERATIONS

MAY BE MINIMIZED, AND THAT CONSERVATISM IN TRAUMATISM MAY BE CARRIED TO ITS FARTHEST LIMITS.

THE AUTHOR.

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PREFACE.

This age in which we live, is one of lightning progress; old ideas are cast aside and new ones crowded to the front.

This, indeed, has been a century of rush and push, and things are often accepted with the stamp of professional approval, before they have been even fairly inspected. Very naturally many of these have had but a very ephemeral existence and scarcely see light, before their hollow claims are exposed and they are cast aside.

Again, we are dazzled by an array of new principles and dogmas, which are, to at once, unravel all the intricacies of diagnosis in disease, and render its subjugation prompt and simple.

But, in a little while, the piercing lens of the just, scientific, and impartial critic and analyst discovers little, but a mere net-work of fallacies.

Nevertheless, history must concede to this age, that in scientific progress and in improvement it has had no equal; and that in no department of science has the ratio been greater than in medicine and surgery.

Ten years ago the virtues of erythroxolon were discovered as an inhibitor of the pain-sense, and as an agent of great value as a local analgæsic in surgical operations.

For six years, I have constantly employed it; every year in more and more cases.

It was expected, that some one of our many fluent, talented writers would, before this late date, have placed on the market a work which would, in some sort of a classified

arrangement, describe the cases in which cocaine could be most successfully employed; give its *modus-operandi* and technique of application; but none such has appeared, or, as far as can be learned, is yet in preparation. For the purpose of, at least, in part, filling in this hiatus, this short monograph is submitted. T. H. M.

NEW YORK, JAN. 1, 1894.

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LOCAL ANAESTHETICS AND COCAINE ANALGAESIA.

PART ONE.

CHAPTER I.

GENERAL CONSIDERATIONS.

We all must agree, that the discovery of the anæsthetic power of ether and chloroform was one of the very greatest boons ever conferred on humanity. Through it, surgery has been revolutionized, the operative field enormously extended, and the sum total of human life, greatly lengthened. While there remains some difference of opinion on the question, as to whether ether or chloroform shortens life, when no immediate complications follow their inhalation, everyone will admit, that their administration is always attended with danger to life; and that many, in the full tide of health and vigor never survive their use. It must be conceded too, that there are many conditions of the organs in which pulmonary-anæsthetics are given, only at a great risk; as, in pulmonary, cardiac and renal maladies. There can be no question also, but, chemically

pure anæsthetics are scarce, the greater part of them being diluted, adulterated or have undergone such changes, as to render their administration unsatisfactory or unsafe.

Therefore, a person about to undergo a surgical operation, under an ethereal anæsthetic, has to face two dangers:

First, that innate to the operation itself, and, secondly, that which attends pulmonary-anæsthesia. That this latter, is no visionary fear or phantom, is amply attested by the full and valuable report of the Committee of the British Medical Association, appointed in 1880, to investigate the entire subject of anæsthesia; and to submit their conclusions, when prepared to do so. The principal object of these investigations was to determine the relative safety, of ether and chloroform.

In the progress of their labors the Committee canvassed the entire profession of Great Britain, and unearthed an enormous mass of invaluable information on the subject, which they had under consideration. The aggregate mortality, it appears, in Great Britain and Ireland from pulmonary anæsthetics is something appalling to contemplate. But, there is no reason to believe it is any less in America. In this country, however, we are not so ready to publish our mortal cases; in fact, it is very rare that one's eye meets a case, in any current, medical journal. Many cases have come to my knowledge in which the patient died on the operating table, but they were never published.

In my own practice, fortune has favored me, as I never had but one patient die suddenly on the table under chloroform anæsthesia; and this case has been fully reported (*Medical News*, June 12, 1889); but, unhappily, with very many who left the table alive, their early deaths were only too traceable to

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the lethal action of the anæsthetic. Many never rallied completely. In others, cardiac paralysis, or a total cessation of renal action, suddenly snapped the vital cord; when, instead of entering the cause of death as due to ether poisoning, we employed the euphemistic terms "heart failure," or "suppression of the urine."

A very elaborate and valuable report has been submitted recently by the London *Lancet's* Commission: ("Report of the *Lancet* Commission, Appointed to Investigate the Subject of the Administration of Chloroform, and other Anæsthetics from a Clinical Standpoint," *Lancet*, April 27, May 6, May 20 and June 17, 1893), giving in full, the details of a large number of cases in which death followed, either directly, or was remotely connected with pulmonary-anæsthetics. Besides, there are included several others in which alarming symptoms occurred, but, the patients survived them. This latter report is highly valuable, because it embodies nearly every description of cases, traumatic and pathological, in both sexes, in both extremes of age, and operations at all seasons, and under every diversity of circumstance; there being included, those who were *in extremis*, and those who were in good, general condition when anæsthesia was commenced.

What strikes the reader, as most remarkable, in examining this report, is the number of deaths from ether. Everyone is aware that chloroform is a treacherous and dangerous agent, in the hands of the most cautious and experienced; though few of us, in America, at any rate, supposed that sulpheric-ether possessed such lethal powers. It appeared to make no difference as to how the anæsthetic was administered, whether by the "open method" or the closed inhaler, for none were abso-

lutely to be relied on, as certain preventatives, against grave symptoms. The number of accidents was large in hernial operations, and operations on the rectum. Many succumbed, when narcosis was induced, for simple incisions, into the bones and joints. There were 55 cases of death from ether collected. The number was greater in the male than in the female. The average age, at time of death, in the male was 46, and in the female 40. In many fatal cases, the "A. C. E." or 1. 2. 3. mixture, was administered. In many, of the chloroform cases, when toxic symptoms set in, ether was substituted. Untoward accidents occured under methylene; and bromide of ethyl and ethedene dichloride are set down as responsible for five deaths; the former for three, and the latter for two. The ether and chloroform mixture, seems to have been equally unsafe; as several deaths are chronicled to have followed its employment. Death had followed the use of nitrous-oxide and ether. It appears from Juillards figures (*Journal de Medicine de Bordeaux*, Dec. 12, 1892, p. 217) that the deaths from ether are about one in 15,000, and one in 3,300 from chloroform.

Unfortunately, after all the laborious efforts of this Commission, it was unable to point out any certain and effective measures for resuscitation; because, as it says, "the same measures adopted in the 'favorable cases' had been followed out in those that were fatal." The report concludes by saying; that, "it has been found impossible to deal with the various materials used in the production of local anæsthesia; and, although there have been numerous reports of deaths under cocaine, they have, for the above reason, been omitted." This latter admission is very unfortunate; though, certainly the consideration of local anæsthetics was beyond the scope of the Commission's duties, yet

it would have been of great value, now that cocaine is on its trial, and promises, at an early day, to very largely displace the pulmonary-anæsthetics, in many cases, for which, heretofore they alone, were employed.

A rather extended notice of this report has been made here, though it may seem foreign to the subject; but, as it again so lucidly and so fully recalls to mind the dangers which always attend chloroform or ether toxæmia, it was deemed proper to insert a few of the salient points, which it embodies. Pulmonary anæsthetics directly kill, through the circulatory and respiratory organs; the patient ceases to breath or the heart suddenly stops. Now, there are four things which are powerful accessories in bringing about a mortal termination under pulmonary anæsthesia: First, the inherent dangers in the operation itself, as, through hæmorrhage and shock. Secondly, the psychological element; fear and apprehension. Thirdly, constitutional disease, organic changes. Fourthly, idiosyncrocies, and morbid susceptibilities.

Innate Dangers.

Every Surgeon of experience, well knows, that it is impossible to prophesy, how an operation will end, for the reason that some subjects bear every sort of surgical manipulation very badly; besides, because, there are inherent dangers, in operations on certain organs or regions of the body. We are familiar with the mortal reflex phenomena which at times attend the dilation of the anal sphyncter, the passage of a sound into the bladder, or an incision on any of the anterior thoracic areas. An anæsthetic may diminish those dangers, but it will not entirely obviate them.

Mental Shock.

The effects of mental shock, fright and dread, are only too well known, to require special reference to them now. Many in the ranks, for the first time before a battery of artillary are mortally palsied at its first volley. Military surgery abounds in the records of such cases.

A most trivial, surgical operation will often induce syncope; and, when this does not occur, the effects on the heart and circulation are apparent. How many times have we opened the veins of the fore-arm, for a phebotomy, only to find them empty of blood? And, hence, why the experienced, will make no show of preparation and quickly divides the vessels, while he diverts his patients attention. An arm may be torn off at the trunk; but, for the moment the vessels of the horror-stricken patient, at their proximal ends, are empty, and lose no blood.

Not a few, have a presentiment that they will not recover. They are wanting in hope, depressed and despondent. Dr. Charles A. Budd used to relate to the class, at the University Medical-College in New York, in his obstetric lectures, the case of a young lady, about to be confined; who had a dream, that she would flood to death on delivery. He acknowledged that it gave him serious concern, for to do what he might, he could not dissuade her, of her presentiment. The time for *accouchement* finally arrived. He delivered her safely; but a mortal flooding set in at once, and she soon sank; as, she had predicted she would.

Systemic Conditions.

The vast majority of our patients, on whom we perform operations for pathological conditions, are of unsound constitution. Many are passed the meridian of life; when, degenerative changes have commenced in the organs, or in the blood vessels.

The emunctory organs are defective in the work of elimination. There is a marked diminution, in the function of tissue metabolism, and the super-saturated tissues fail to throw off the excess of ethereal fluid, accumulated in them. A tuberculous or emphysematous lung, imperfectly eliminates the volatile elements with which its interstitial tissues are charged, or may cease to expand altogether. Ether plays havoc, with defective renal organs. In cardiac maladies, we always give ether or chloroform, with trepidation and apprehension. Our patient under these conditions, may suddenly blanche or go into a mortal syncope, with the first few whiffs of chloroform; and after ether, pneumonic symptoms may follow, the cold, chilled inhalations; renal secretion may suddenly cease, when we will have suppression of the urine.

Individual Idiosyncracy.

It is notorious that infants and children, proportionally, require a much larger quantity of an anæsthetic agent, and come out from under its influence more quickly than adults. We will sometimes meet cases, in the adult, in which, it is quite impossible to induce the full anæsthetic coma of ether

or chloroform, without giving great quantities; or, inducing grave cerebral or pulmonary symptoms. Violent vomiting at once commences, tetanic spasms seize the whole muscular system, deep cyanosis sets in early, with irregular striduluos breathing. May not individual peculiarity, or a positive idiosyncracy in a large part, account for many of those sudden deaths under chloroform anæsthesia? It is perfectly rational to assume that ether will play the same rôle in certain individuals. A medium dose of opium has often induced mortal narcosis. Strychnia, arsenic and any one of the powerful agents employed in pharmacy, in moderate doses, occasionally give rise to grave symptoms.

CHAPTER II.

LOCAL ANÆSTHETICS AND ANALGÆSICS.

It is therefore, evident, that while pulmonary-anæsthetics are an inestimable boon to humanity, their administration is fraught with danger; immediate and remote; that, that state of suspended animation or cerebration, of total inhibition of the senses and the sensory nerves cannot be induced, with impunity; but, that as Dr. Sigismund Waterman, of New York, so clearly pointed out, in his exhaustive and analytical studies with the spectroscope, ("A Spectroscoptical Study and Critical Analyses of the Morphological Elements of the Blood in Those who have Submitted to the Full-Anæsthesia of Chloroform, Ether or Nitrous-Oxide," p. 117), the blood undergoes the most radical changes after the absorption of an anesthetic. The red corpuscles are diminished in number and size; their investing capsule is shrunken and irregular in shape; they disintegrate and clog the capillaries, and a favorite seat for their residue, he found, was in the parenchymatous elements of the viscera; particularly the brain and kidney.

On contrasting the chemical composition of the blood, before and after anæsthesia, Waterman found it profoundly altered. He gives, *in extenso*, a large number of cases, which had come under his observation, wherein the remote con-

sequences of anæsthetics were most disastrous. Nitrous-oxide, he found, was particularly baneful in the female sex.

From the foregoing, it is clearly evident, that in the past we have been altogether too indiscriminate and reckless in the use of anæsthetics. But, in order to escape dangers, we must avoid their occasion as far as possible; wherefore, if we would reduce the drawbacks of anæsthetics to a minimum; two things, in particular, are imperative.

First, we should decline to employ pulmonary anæsthetics in all trivial, or brief operations.

Secondly, we should cast about us for some agent or substitute which, in a large measure, may replace them. For the purpose of accomplishing this latter object, at least, in a certain measure, our present labors are undertaken.

Local Anæsthetics.

Since the very earliest times, various means have been in vogue for effecting local-anæsthesia. The limb has been tightly compressed above the site of operation. Different liquids and medicated effusions have been employed. The parts have been chilled with ice; and later, partly frozen with the ether spray. It is claimed that the parts in certain impressionable individuals may be rendered senseless by hypnotic suggestion, electricity, etc. In pre-anæsthetic days it was advised for wounds in battle, and traumatisms in general, that they be operated on, as soon after their infliction as possible, while they were yet numb; and, before the onset of inflammation.

Local anæsthetics were never satisfactory. This was, because, to secure any degree of success at all, required more than ordinary skill and judgment, and for the reason that in order to deaden the parts to feeling, dangerous freezing of the tissues, in careless hands, frequently occurred. Another cogent objection to them, was, that the pain which their application entailed, might be greater, than that inflicted in operating. No one ever ventured their employment on inflammed parts; if we accept a furuncle.

When we bear in mind, the cardinal distincion between a local anæsthetic and an analgæsic, we can the better appreciate the harmful consequences which may follow the former. A local anæsthetic of an intense frigorific character produces chemical changes, and temporarily destroys *all* sense. But an analgæsic only effects the pain-sense, and in no manner induces chemical changes, or endangers the vitality of the tissues.

A temporary asphyxiation of the distal parts of a limb, by an elastic bandage, effects a diminution of sensation, by retarding all metabolic processes and diffusing through the tissues imprisoned carbon. Refrigorant processes are essentially those of dissolution; which, though, when arrested at the right time, effect no serious detriment to the cellular elements. Parts may be suddenly chilled, or even frozen through, when proper precaution is observed, without permanent organic change succeeding. The former is a simple and safe procedure. Its mode of action, is, by producing a local shock to the parts; the terminal filaments of the sensory nerves are momentarily benumbed, and there is a prompt contraction of all the peripheral vessels and capillaries, so that immediately on incision

there is a noticeable hemostasis, when the incision is not carried deeper than the integument.

When it is intended to carry anæsthesia into all the parts *en masse*, and totally destroy sensation, then, some powerful frigorific must be employed, To effect this, however, in itself, is a very painful proceeding and not only that, but dangerous to the vitality of the tissues. For this purpose, a mixture of common salt and broken ice has been employed, and, sometimes ice alone. Of late years the ether spray has been utilized. When frigorific agents are utilized, the skin is whitened, stiff and brittle. The blood is all driven from the surface into the deeper parts; the aqueous elements in the tissues become congealed, and all the structures solidify, in one homogenous mass. So that, except, for the purpose of making a puncture or incision painlessly, this species of anæsthesia has a very limited application. In many on whom it has been injudiciously employed, uleration or gangrene has followed. In any event, it is clear that through it were devoid of any mishaps, as, a delicate isolation and dissection of the parts are quite impossible, when all the animal fluids are solidified, in many surface operations, it has no place at all.

Analgæsics Locally Applied.

During the past decade the pharmacological chemist, through synthetical processes and experimentation with coal-tar products has been prolific in providing the profession with internal analgæsics. Carl Koller, in 1880, accidently discovered the local analgæesic properties of the hydrochlorate of co-

caine. He discovered, that it acted with great energy on mucous membranes; notabley, on the conjunctiva, the membrane of Schneider, and in the buccal-cavity. It was observed too, at the same time, that it was a hæmostatic agent of great power.

Its action is very feeble, if any, on the unbroken integument. It acts with varying power on the mucous membrane, of the various passages. Cocaine applied on the surface, or subcutaneously, produces no chemical changes, but spends its energy, wholly on the sensory nerves, and the vaso-motor filaments. It paralyses the pain sense and vascular, nerve-supply and, hence, is an analgæsic and hæmostatic.

On incision of the tissues, the patient feels the blade divide the parts, but has no dolerous sentation accompanying it.

Dr. Corning, of New York, has devised a means, by which the analgæsic action of the drug, when subcutaneously injected into a limb, may be protracted. He confines the venous circulation, by an elastic bandage applied, above the point, on the limb, at which an operation is to be performed. The analgæsic power of cocaine remains about thirty minutes, in some slightly a shorter period, in others somewhat longer. Except, when applied on mucous membranes, or open wounds, ulcers or sores, cocaine, locally administered is a somewhat painful procedure. Many deep punctures of the hypodermic needle are at times necessary. There is a possibility of infecting healthy tissues by impure solutions or unclean instruments.

In all cases of cocaine analgæsia, by hypodermication, more or less of the medicament is taken up by the general circulation; and therefore, in certain degrees, its action is simultaneously, both

local and constitutional. Clinically, at least, the action of cocaine is very closely allied to morphine. It is moderately narcotic, is exhilerating in its effects; it strengthens the heart's action, and begets a state of quiet, mental repose. Therefore, why so many are the abject-slaves of the "cocaine habit;" and in no calling, it seems, to a greater extent, than among members of the medical profession.

There are many other substances, besides cocaine, which possess analgæsic properties. Pure water, alchohol, oleaginous substances, solution of thermol, camphor and antipyrine, and other chemical agents, induce more or less numbness in the tissues after hypodermic injection. None of them, however, are of any practical value, for the reason, that they irritate too much; or, are too transient in their effects.

Cocaine, in the largest measure of any medicinal agent known, fulfills the demands of a local analgæsic. But, like all other valuable agents known, its administration must not be indiscriminate, nor employed without studying our cases, and providing ample safe-guards against failure or accident. Its lethal, toxic action, in certain individuals and its utter failure to act in others, are the most serious objections against this potent agent. It is well, that both sides should be candidly and unqualifiedly presented, in dealing with a question of such vital importance as this.

Our antiseptics have enormously enlarged the operative-field. If we can render operative intervention, painless and safe without pulmonary anæsthetics, it is plainly our duty to endeavor to accomplish this end. But, in so doing, we must avoid the intemperate zeal of the enthusiast, whose high coloring and unqualified vaunting of certain therapeutic agents

and surgical procedures have often deluded the unwary, into the commission of serious errors; and besides, has made the prudent and circumspect to look with suspicious and doubt, on many really valuable modern acquisitions, which well merit an intelligent trial.

CHAPTER III.

THE INDICATIONS AND TECHNIQUE FOR LOCAL ANÆSTHETICS.

Indications.

These may divided into two classes; first, those in which there are good and substantial reasons for declining to administer, by the respiratory organs, or subcutaneously, a chemical anæsthetic or analgesic of any description. Such cases are unusual. Secondly, those in which the operative intervention will occupy but a moment; as when the parts to deal with, lie near the surface; when apparatuses or assistance are not within reach, to administer other agents.

Should our patient manifest symptoms of serious organic disease, or give a history of having suffered previously, over a protracted period, after a constitutional anæsthetic had been administered, or should our patient be a pregnant female, or a very young child, and the operation be one not attended with the division of large blood vessels and occupying but a short time, then, local anæsthesia, if any, should be preferred. With nervous, apprehensive patients, though we but merely make a "show," and impress them that we are employing our best efforts, to diminish their sufferings, the effect will be most

salutary; and though we accomplish nothing in the way of direct, local annihilation of sensation; yet, when we are through, our patient will often declare that we gave him no pain.

Mechanical Anæsthesia.

There are very many instances of surgical intervention, which, by the skilled and judicious application of force and the employment of instrumentation, pain may be greatly diminished, or wholly obviated.

In adjusting certain fractures, or reducing dislocations, the careless inadept, will inflict a vast amount of pain and torture; but, the obdurate spasmodic contraction of the muscles refuses to yield, or will, only in a measure relax, and the operator fails. In the gentle and skilled hand of the master, but little or no resistance is offered by that muscular fibre, which may be coaxed, as it were, but not forced. The latter begins, by drawing out his patient; feeling them; psychologically, so to speak; he gains their confidence and inspires them with hope; now, he turns to the limb, and by a process of shampooing, massage, extension, pressure, etc., "puts the muscles asleep;" when, with a sudden dexterous movement, effects immediate approximation of the fragments, or returns the head of the luxated bone into its socket.

An ample and varied supply of properly constructed instruments, kept in proper condition, when judiciously employed are of infinite value in abbreviating, simplifying and rendering surgical operations less painful and dangerous. A clean cut, with a keen edge, is much more painless than when

an incision is made with a dull scalpel, which requires two or three strokes, to divide the integument. Sharp-pointed needles, of a proper size, make the closing of a wound a rapid and painless procedure. Therefore, it may be said, that mechanical anæsthesia, constitutes in itself, an aid of vital importance in all operations; but, particularly, in those wherein volatile fluids are not inhaled. This, of course, embraces every detail of preparation; as, ample assistance, good light and perfected dressings.

Thermal Anæsthesia.

The temperature of fluids has been taken advantage of, as an anæthetic, since the remotest antiquity. A low temperature succeeds the best, on the surface, while increased heat is the most serviceable on the nude tissues. Cold is a powerful cardiac depressant. It drives the blood from the surface to the internal organs; and, when locally applied continuously, first, it chills the surface. In this state of chilling, the parts will endure the quick incision of an abscess, the removal of a splinter, etc., without pain.

If cold is long continued, a sensation of pain sets in, to be promptly followed by numbness. This is the second stage of freezing. Now, many surface operations, which do not extend into the deep parts may be conducted, withont severe suffering or, indeed, any great distress.

Third Stage of Frigorific Consolidation.—This entails the total annihilation of sensation and complete suspension of vitality. The part *en bloc*, is temporarily dead. This

state is imperative in finger amputations, bone *grattage*, or resection, in onychia, surface necrosis, etc.

If great care be observed, no serious harm to the tissues may follow, after this freezing process; but, in many cases, it is quite impossible to avoid accident, and a gangrenous sore may follow, much more troublesome than the condition for which the surgical operation was undertaken. At the present day, with other safer agents at our command, it cannot be said that this severe degree of freezing is justifiable. In my hands, in many operations, in which the effects of a local benumbing of the parts has disappeared before the operation is completed, the free irrigation of the nude surfaces, with water of one hundred and forty degrees (140°), exerts a marked sedative action. It gives tone to the heart, favors hæmostatis, and blunts the sensability of the nerve fibrils.

Ether evaporation is the most effective and convenient means for local anæsthesia. With it, we can gauge with precision the extent and depth of tissue-anæsthesia. In the absence of this, then, we may accomplish something, with broken ice placed in a rubber cloth or bag. But, it is better to apply the ice directly to the skin, for a moment, and then cut. The ice-water douche, the water being poured from the neck of a pitcher, raised some feet above the patient, has often proved serviceable in my pratice.

Mode of Application.—In all cases, in which it has been decided to employ local-anæsthesia, there are certain conditious and details necessary to observe, in order to attain the greatest measure of success. These refer to the general condition and local state of the parts. It is well, when oppor-

tunity permits, to operate two or three hours after a full meal. The patient should be moderately dosed with alcoholic stimulants. Anything from champagne to brandy may be employed. This should be commenced an hour before operation. The patient should be placed on the back.

If we are to operate on a limb, the part for division should be thoroughly prepared and isolated by sterilized towels. When anæsthesia has been effected, we must have everything in readiness, and go through the operation with all possible celerity.

It may be said, of local-anæsthesia, that there are comparatively few cases in which, through it, sensation is wholly suppressed. The patient is almost invariably conscious of more or less pain. This, however, constitutes no valid objection against its employment in general; but, on the contrary, in certain types of pathological conditions it is an advantage. These cases, in which but partial anæsthesia is desireable may be grouped in two classes:

First, The arthroses.

Secondly, The feeble, and those suffering from organic disease.

There is a numerous class of joint-neuroses, in which inflammatory changes may be present, in a moderate degree, or wholly absent, that may derive great benefit from sudden psycological and physical impressions. It is through fear, that in our time, practitioners do not sufficiently often, avail themselves of these agents, as therapeutical aids.

In that class of cases designated, in surgical nomenclature, as pseudo-anchyloses; those stiff, painful joints, following an injury, particularly, in impressionable, hysterical individuals,

the moderate infliction of pain, in association with skilled and cautious manipulation often produces remarkable results.

With this class, the charlatan and the bone-setter work wonders.

One has wrenched the shonlder, elbow, wrist, hip, knee or ankle. The patient is assured by the medical attendant, that perhaps, the injury is but trivial. The patient is particularly urgent to know, if there be a fracture or dislocation. The limb is perhaps immobilized, or possibly the case is dismissed with a liniment, or the patient is directed to apply cold application. But, joint distraint remains, with more or less pain, and all the parts over the seat of injury are exquisitely sensative to pressure.

In vain our patient applies from one physician to another; in the meantime, consulting with the most eminent; but, possibly, all agree that no bone is broken and no joint displaced. Yet, the limb remains practially crippled, the leg will refuse to support the body or the grip power in the hand is nearly lost. It naturally, is quite incomprehensible to the invalid, how it is, that if there is no serious damage inflicted on the limb, it still remains of little or no use to him. At last, with patience exhausted, and in a state of despair, his friends spirit him away to the hydropathist or the "natural bone-setter," who has come to town, for a brief stay. The former, has made a deep study of hydro-therapy and is thoroughly familiar with the marvelous properties of douches at varying temperatures; combined with massage, passive motion, bandage-pressure, and physological rest. He immediately secures his patients confidence, by his gentle and painless manipulation of the limb. The joint gradually limbers out; natural warmth returns, the

nutrition of the structures improves and in a while perfection, or approximate perfection of function is restored.

The natural bone-setter accomplishes the same purpose; but by a shorter route. Immediately, on seeing the limb, he will declare that "the bone is out" and assures his patient, that necessarily the first step, demanded, is reduction of the displacement.

Our patient is thoroughly unnerved; for, he instinctively appreciates what suffering this entails. Now, the operator with great alacrity, before the apprehensive, awe-stricken patient has recovered himself, seizes the affected member, and with a quick, but cautions motion, gives the joint a twist, flexes and fully extends it. As the adhesions give, loud, audible snaps are heard; the patient groans or screams; when, almost at once, after seizing the limb, it is liberated. The patient is now commanded to walk, if it be the lower-extremety which was manipulated; and, much to his amazement, he can do so, without pain or difficulty.

I have long since discarded pulmonary-anæsthetics in liberating this class of anchyloses. In those cases, in which the anchylosis was liberated under ether, though the limb was freely movable, yet the patient was timid and wanting in confidence, so that he would not exercise it himself; without which, of course, in forty-eight hours the joint was as stiff as ever.

Hence, in all those cases after fracture or other traumatism, in which it is important to overcome the anchylosis promptly, the results are more satisfactory and permanent when, but partial; topical anæsthesia is affected, by douching;

and, now, all adhesions are completely sundered; while our patient is in full possession of his senses.

Illustrative Cases.

Case 1.—Patient, a Spanish lady of immense avoirdupois, weighing nearly 300 pounds. This lady had been injured in her right shoulder, six months previously, by a fall down the stairs of one of our elevated railroad-stations. After she slipped, she fell with great force and struck on the right arm and shoulder. She suffered considerably from shock by the fall and had to be carried home in a carriage. After a few days rest in bed she recovered fairly well, except for the condition of her shoulder and arm. After the family-physician had tried the usual remedies for sprains and contusions, and the limb not improving, a distinguished surgeon saw the case. Now immobilization was tried, but no improvement followed. Then she was etherized and forcible motion employed, with the same result. She then went to a neurologist who informed her that the brachial-plexus was probably lacerated and that she had neuritis. Medicines were given and electricity locally applied, repeatedly; all with no benefit. For a month before I saw her, she had given up every description of treatment.

When she came under my care her general condition was very fair. She denied ever having had rheumatism or neuralgia. No evidence of organic disease. The arm, from the shoulder down, was quite helpless. The shoulder could be drawn backward and forward, inward and rotated slightly; but, the power to raise the arm was lost, and all range of mo-

ion was greatly limited. The grip of the hand was feeble and the strength of the forearm was greatly diminished. There was no impairment of sensation. On the contrary, at the shoulder, it was markedly exalted, even on moderate pressure. The head of the humerous moved freely within the glenoid-cavity.

After a careful examination of the case, it was clearly apparent to me, that the limitation of motion was entirely attributable to an organized residue of inflammation; which occupied the thecal lumina of the tendons, the muscle-sheaths and the intra-muscular spaces. I was hopeful, that the organic changes had not yet involved the parenchymatous elements of the muscles, and that the vascular apparatus was unimpaired.

Liberation of the Joint.

The patient was given three ounces of brandy, then she was placed sitting, on a low stool, and the entire arm, from the hand to the thorax, was steamed with towels, wrung out in water as hot as could be borne. The shoulder was deeply imbedded in these for about ten minutes, when the parts were annointed with sweet oil. Now, motion was commenced in various directions; the head of the bone was steadied with one hand, while with the other leverage action of the arm was effected. No great difficulty was encountered, until the upward motion was essayed. Now, she gave a loud scream, and fell over into the nurse's arms in a swoon. At the same instant I was able to liberate all the firm, unyielding adhesions which held down the humerous. I was satisfied, that the fib-

rous anchylosis had been overcome. She soon rallied.

After a few moments rest, she commenced to move her arm in various directions, greatly to the surprise of her husband and children. I saw her but twice after. She promptly recovered full and permanent control of the limb; and, as motion and strength returned, all pains and lameness vanished. This was a typical case in which to test the merits of avulsion, without general anæsthesia. It was insisted in this, as well as in all similar cases, that exercise and gymnastics be kept up, until function was fully restored.

Elbow-Joint Anchylosis.

True and false anchylosis are very common after violent wrenches and fractures. The pseudo-anchyloses are the most common in young children, who take pulmonary anæsthetics, rather badly. Their stiffened joints need passive motion, often repeated; so that the frequently repeated inhalation of a volatile lethal agent must be productive of injury to the organs. I have found in these cases that alternate hot and cold douching of the surface seems to exert a happy influence in stimulating the circulation and annulling in part, sensation, thereby dispensing with ether or chloroform.

Case 2.—This case illustrates a pseudo-anchylosis at the elbow-joint with treatment by partial, surface, thermal anæsthesia. Patient, 36 years of age, and a major in the militia. While in camp with his regiment he was thrown from his horse, striking the ground, on his elbow. The joint was badly sprained. He was excused from duty and returned home with

a stiff, swollen joint, and the most intense pain down along the course of the branches of the median nerve in the fore-arm. No fracture nor luxation could be detected. The various remedies had been tried on him, without much benefit, the elbow remaining painful and stiff.

One month after the injury, Dr. R. J. Fitzgerald, under whose care he finally came, turned the case over to me, as he said, he believed radical measures were called for to overcome the stiffness at the joint, which, was becoming more and more aggravated, with time.

His general conditions when he came to me, was good, but, he was quite despondent, at the prospects of having a crippled arm for life. All the parts about the elbow were tumified and sensative, and the fore-arm was quite immovably fixed, at a right angle with the arm. He had pain through the flexor surface of the arm, and he couid only close his fingers with difficulty. In this case, I found, that the alternate cold and hot pack, greatly alleviated the pain and permitted of more or less action in the joint. Indeed, I was able to quite overcome all resistance by the thermal anæsthesia as an aid to subdue pain. He made no outcry, and confessed that it surprised him that the anchylosis could be so readily overcome. He was directed to keep up active massage and gymnastics. He returned to his position, as an architect, the next week, and since has had good use of his limb.

CASE 3.—Patient, a boy, 8 years old, who, two months bofore, had fallen from a fence, a distance of eight or ten feet, to the pavement, striking on his right hip. After lying in bed four or five days he was allowed to get up, but could only move about by using a chair or a crutch. He was seen soon

after this, by a practitioner, who pronounced his condition hip-disease, and at once placed the joint in a gypsum dressing, which extended from the trunk to the toes, on the effected side. The parents becoming impatient, as they were warned that hip-disease pursued a very chronic course, I was invited in to see the case. A careful examination convinced me, that there was no articular disease, but the immobilized, rigid joint was fixed, by a pseudo-anchylosis.

Therefore, at my first visit, after steaming the hip with repeated hot packs, and by using but moderate force, I was able to readily overcome the muscular adhesions which prevented the free, gliding motion, so necessary in the unimpeded action of the muscles. Recovery of full use of the limb was rapid and complete, and in two weeks from that time he walked without a limp to my residence, a distance of over a mile.

As the knee-joint is devoid of a muscular envelope anteriorly, we less frequently encounter a false anchylosis there, than in other articulations, though it is occasionally seen, generally, of a type, which does not require the application of force to over come it.

Although the same anatomical peculiarity subsists at the ankle-joint as the knee, yet, after certain traumatisms, persistent stiffness obtains, with limitation or suppression of motion, and painful locomotion; which, will require force to overcome it. This is well illustrated, in

Case 4.—Patient, 14 years old, wrenched her ankle by a fall nearly a year previously. For a considerable space of time she was unable to put any weight at all, on the foot.

After several weeks, by the aid of a crutch, she was able to move about, by keeping the knee flexed and the foot off the ground. She wore various orthopædic apparatuses, but the state of *pes equinus*, or raised heel, remained. Her parents, in despair, sent her the rounds of our numerous dispensaries and hospitals, but, without any substantial improvement. She remained a cripple.

It is needless to say, that through forced inaction of the limb, in the growing child, there were both mnscular atrophy, and shortening. But, on a most painstaking examination, there was no decisive evidence of organic changes in the osseous or arthritic elements of the joint effected. It was my impression, that the joint was wholly free of disease, and that it was immobilized entirely by the several muscles which were adherent by a former myitis; and contracted through non-use, over so long a time. Our patient was prepared for the breaking down of the adhesions, by having the foot, ankle and leg freely shampooed and douched with water, as hot as could be borne, for half an hour; when the foot was seized, and the ankle fixed. Now, by firm, steady motion for a moment, the adhesions were heard and felt to give way; the muscles elongated, and full motion was restored at the ankle-joint. In this instance, although there was considerable pain experienced when the adhesions gave way, yet, on manipulation of the foot, that exquisite sensativeness of the integument, so marked on entrance, had been quite overcome.

CHAPTER IV.

MODUS-OPERANDI OF THE THERMAL AGENTS IN REDUCING THE PAIN-SENSE.

Sudden and intense cold act by the extraction of heat, the contraction of the capillaries, and the coagulation of the albumen; when, continued long.

When, only the ephemeral effects of cold are required, as, in making an incision through the integuments, then our purpose is accomplished by producing a local chill or shock to the sensory-nerve filaments. Cold congeals, hardens and increases the rigidity of muscular fibre. Frigorifics, when carried to a certain degree, so completely coagulate the blood, and empties the capillaries, as to constitute a useful styptic. Wherefore, why cold fluids serve a useful purpose, especially in open, lacerated wounds; when the parts often, are benumbed by the trauma; when any crushing pressure has been borne; and, often certain areas of sensation are inhibited by the division of nerve branches. The germicidal potency of a low temperature has been disputed; but, in healthy, aseptic wounds, Nature will, unaided, complete repair without the cold fluid infecting the tissues; and, though it will not, like intense heat, destroy all microbic atoms, it will suffice in many cases, where necessity requires it, as a benumbing agent.

There are certain, interesting, clinical peculiarities about thermo-therapeutics. In one class of cases, fluids of a low temperature will immediately relieve pain and produce a most refreshing impression, while in others of the same type, hot cataplasms are most grateful, and cold intensifies pain. As a general rule cold, icy applications are great pain-appeasers, over the head; though heat is prompt and energetic on any part of the trunk. Intense cold acts as a depressant, for a period, devitalizing the parts.

Heat is rather an analgæsic than an anæsthetic when locally employed within limits. Its action is totally unlike cold. It stimulates the circulation, produces a relaxation of all contractile tissues, particularly the walls of the capillaries. Its local, derivative action is utilized for infinite purposes by the medical-practitioner. It produces a stimulant action in all the tissues, and sharpens nerve-sense when first applied; but, as its application is continued, and perhaps increased, sensation is diminished. Its action is modified by different pathological conditions. In the presence of inflammation it reduces pain and accelerates tissue metamorphosis.

Heat, like cold, is a powerful hæmostatic; though its action is dependent on totally dissimilar phenomena. Moderately cold liquids close the bleeding points by *vital* processes, and heat by *chemical.* But, heat exercises no anodyne action on open lacerated tissues to such an extent as to reduce their sensibility to pain on manipulation; besides, to produce its styptic action, the temperature of liquids must be raised to nearly the boiling-point; when they indiscriminately coagulate all the albuminous elements; and, over nude bone surfaces,

lead, by their irritating action, to an ultimate, low grade of osteo-myelitis.

Heat, then, in surgery, as an analgesic of moderate utility, may be advantageously employed, over the unbroken surfaces, and chiefly, in the class of arthroses and muscular anchyloses cited.

Brevity of Surface or Local Anæsthesia.

Safe, peripheral anæsthesia is transient. This implies the need of dexterity and rapidity of execution, in operating. In our times, of all things, attention to detail and minutia in the preliminaries of an operation are imperative. This applies to every species of surgical intervention. But, in the absence of a pulmonary anæsthetic it is of pre-eminent importance.

The old operators cultivated the art of celerity in manipulation, to a very high degree. Civiale, we are informed, seldom occupied more than fifty seconds in cutting for and extracting a calculus frcm the bladder (*Le Médicine Modérne*, June 7, 1889). Any, average operator could disarticulate at the hip-joint in from forty to eighty seconds. Now, the prevailing impression is, that haste is essential to success, only, in abdominal operations. But, this certainly is incorrect, for, everything else considered, the shorter the operative time, the more certain is operative success; and, ultimate recovery, without serious sequelæ. Therefore, with everything in readiness, good light, and ample assistants, the most painful part of many operations on the human body, may be performed within thirty minutes. Certainly, operations on the bones, and within the cavities, will consume much more time.

But, in any event, as the integument and cellular tissue only, are highly sensitive to pain, after a cavity has been opened, we penetrate a region, practically devoid of painful sensation. Very many times, have the healthy viscera of the cranium, spinal cord, thorax, and peritoneal cavity, been pricked, and gently compressed by me, in operations, while consciousness was in tact, without the least pain being elicited.

Therefore, if we effectually obtund sensation, for, but a moment or two, an enormous gain is made, both for our patients' safety and our own convenience. This can be accomplished in a large number of cases. We are often placed in embarrassing situation, by our patient, when a promise is exacted from us, that we will give them *no* pain. They may prove refractory to local anæsthesia, or possibly, we may encounter unexpected difficulties in operating. If we have an opportunity to moderately inebriate our patient, this difficulty can be partly obviated. It would be interesting to learn, if there is any diminution of the reparative energy of the tissues and their resisting power against the introduction of sepsis, by the use of those chemical agents which saturate the whole system, before the full coma of ether anæsthesia is produced.

An aseptic wound favors primary union. This ideal we have obtained, so that, in this direction, we need look for no improvement. Very probably, if gain there be to the patient, by limiting the employment of chemical anæsthics, it must apply, rather to the general system, than to the local condition of the wound.

CHAPTER V.

DETAILS OF TECHNIQUE IN THERMAL-ANÆSTHESIA AND APPROPRIATE CASES.

Thermal anæsthesia may be produced:

First, by *evaporation.*

Second, by *fluids in motion.*

Thirdly, by *congealed water and salt.*

Sulphuric ether is the agent most commonly selected for local purposes. It is pulverized by a spraying-apparatus. The parts having been previously prepared, we commence by limiting the area, on which we propose to operate.

Ether atomization is seldom employed, except on unbroken surfaces, and must be confined to a narrow field, so that we will fail, or, do harm, if we try to cover too much space, at one time. Spraying should be commenced slowly; and, as numbness sets in, and the skin begins to blanche, it should be pressed quickly, for a moment; in the meantime, being cautious, that the parts are not too deeply congealed, when our incision is quickly made. Our operation completed, cold water should be applied in order that the local reaction, is not too rapid.

It is obvious, that the field for local anæsthesia, by the ether spray, is a limited one. Hence, it is safe and efficacious only in those cases, in which a simple incision is to be made, or in some very short, trivial operation on parts, which lie near the surface; as in abscess, superficially located; for the removal of splinters; diminutive cutaneous papillomata, etc.

Agitated Water.

The anæsthetic power of cold water is greatly exhanced by applying it in rapid motion, and suddenly. For this purpose, a syphon of ice-chilled carbonated water, quickly squirted over the operative field is of marvelous efficacy in dulling the pain sense in the integument to the keen edge of the scalpel; and, giving us, an anæmic incision. In the absence of the gaseous liquids, a pitcher of ice-water, poured from two or three feet in height on the surface, in my hands, has often served me an admirable purpose. Either of those simple expedients is equally as useful as ether-spraying; in a large number. It is devoid of its dangers, and always accessible.

A mixture of crushed ice and common salt is a potent, freezing compound, but its application is attended with so much pain, and its action is to destructive, that its employment can seldom be justified. It had been utilized before the discovery of ether in amputation cases; but, gangrene so commonly followed, that it was very generally condemned.

Larry, however, it appears, in military surgery, had employed it with varying success in the Russan campaign, in a few amputation cases; but, he emphasized its dangers and unreliable effects ("*Des amputations dans les membres in-*

ferior es, memoires de M. le Baron Larry," tome 6, p. 417). I have never had any experience with this species of frigorific. An extended consideration of its use would be of no practical value; for, only from an historical standpoint, has it any interest at all.

PART TWO.

CHAPTER VI.

COCAINE ANALGÆSIA.

Of all the greatest discoveries in this century there is probably none in the whole domain of medical science which exceeds in importance, that one, through which the profession was given that inestimable boon, Cocaine Analgæsia. For one to behold, the painless penetration of an eyeball, the division of tissues, excision of tumors, benign and malignant, the canalization of the trachea, trephining of the skull, and an almost infinite number of other surgical operations, seems more like a dream or a vision, than a realistic fact.

The discovery of pulmonary-anæsthetics, about fifty years ago, wrought a prodigious revolution in the principles of surgery. There was no species of surgical operation, that it did not make its impress on. The whole professional world seized on them, almost at once; and, in a little while, their employment was the general rule in every manipulation attended with paln. By them, the operative time was greatly protracted, so that the operator was permitted greater leisure, and those grave pathological conditions, formerly discarded as

unsuitable for the surgeon's knife, were now brought within the range of legitimate surgery.

The success, nay! the very possibility of abdominal and pelvic surgical operations was quite out of the question until the time came, that the sensory functions of the nervous system could be temporarily inhibited. These, are time consuming operations. In pre-antiseptic times they all had been essayed; but given up; because, of the impossibility of carrying out an efficient technique, within a serous cavity, while a patient was writhing and groaning under severe pain. Many other regions of the body, are now opened to the surgeon, through the agency of anæsthetics.

Now, if we could be assured, that while consciousness and pain are suspended during the progress of operation; that our patient were the more effectually secured against shock; that the administration of ether, or chloroform in itself, is not attended with danger and unforseen accidents; and, that, in many, suffering from organic disease, its administration is not attended with risk, then, there would be scarcely any advantage to be gained by the substitution of another agent.

But, we do know, that while the mental faculties are in abeyance, and all conscious sensation to mutilation is lost, still animal instinct remains, and the economy yet preserves its impressibility, when vital structures are exposed or mutilated. Thus, we will observe, that commonly, when a serous cavity is freely opened, the pulse becomes nearly imperceptible, a deathly palor covers the features, and the respiratory functions are seriously disturbed. In many protracted operations, the most profound collapse may succeed. There is a state of such extreme depression occasionally wit-

nessed, that it is out of all proportion, with the extent of operation; which condition by different surgeons, notably, the late B. A. Watson, was designated "Ether-Shock."

It would be a work of supererogation to speak of the deadly potency of chloroform. Its lethality is enormous; and, if we could only secure reports of all the mortal cases and group them, their number would be appalling. This agent kills with such alarming suddeness, in many cases, that prophylaxis is out of the question. Nor, does it appear, that safety lies in a combination or dilution with other anæsthetic fluids.

As many constitutional infirmities preclude the employment of general anæsthesia, we cast about us for something, which may be employed, as a substitute, when we wish to annul pain. Erythoxylene, or the alkoloid of coca, in a large measure, possesses all the advantages, with but few of the objections of pulmonary anæsthetics, in a large number of operations.

Cocaine.

The alkaloid of erythroxylon-cocaine, is the most powerful local analgæsic known. It is rather a remarkable coincidence, but nevertheless true, that the medical profession is indebted to America for the first efficient pulmonary anæsthetic; and that, the coca-tree, which yields the leaves from which cocaine is extracted, grows, and thrives, only in South America—in Peru, and the adjacent states.

In 1855, Gardake discovered in coca an alkaloid, to which he gave the name, erythoxylene; a name, by which it is at present known in the United States, and British Pharmaco-

pœias. This principle, however, had been studied earlier by Dr. Albert Meinan, who gave it the name, cocaine.

We are informed, that from the days of the Incas, coca had been employed by the natives of Western South America in enormous quantities as a stimulant, and a tonic against hunger and fatigue. About forty-millions pounds are said to be harvested annually in Peru.

It was not until 1884 that Carl Koller first discovered the potency of cocaine as a local analgæsic; when he employed it in the surgery of the eye. To Paul Réclus are we indebted for its introduction into general-surgery, for describing the technique of its application subcutaneously, and for classifying the cases, in which it may be most appropriately employed.

Cocaine is heavier than morphine, its atomic elements being, C_{17} H_2 NO_4. It is a crystaline alkaloid. Applied over the tongne, it not only annuls sensation, but destroys taste. Physiologically, it is a cardiac and respiratory stimulant. The pulse is rendered firmer by its administration, and its beat is more rapid. Breathing is also rendered more rapid and shallow, In moderate doses, its action is mostly exhilerating, and stimulating. In lethal doses, it effects all the senses. Vision is blurred, there is ringing in the ears, the pulse is quick and irregular; and it is but slightly narcotic.

In England, a physiological committee concluded, that in cocaine-paralysis, the terminations of the sensory nerves, and the posterior columns of the cord were effected; while the anterior columns escsped. ("Ringer's Therapeutics," 9th Ed., p. 610).

The alkaloid is largely eliminated by the kidneys (when

given in large doses); though ordinarily, it disappears by oxidation.

The hydrochlorate is the form generally used. This is freely soluble in water, and readily assimilated.

A phenate of cocaine has been recently put on the market, which, it was supposed, might be preferred for dermic or hypodermic employment; but, as it is insoluble in water, and can be liquified only with alcohol, it is extremely irritating, and causes much pain, when injected.

Solutions of cocaine act with great energy on the mucous-membranes when locally applied. When thus utilized, its action varies in different situations. The integument is proof against it in normal conditions; but when the seat of itch, or the pain of inflammation, the drug, in strong solution, affords great relief here.

Difference in the Degree of Susceptibility and Diversity of Action.

It is said that children are, proportionally, more susceptible to its action than adults; and, that women are not only less resistant, but that its manifestations with them are often peculiar and erratic. As infants and young children are not good subjects for surgical-cocainization, it must be very rarely employed with them, unless under special circumstances. There can be no question, but that the sensorium is profoundly effected in the greater number of females, when cocaine is subcutaneously employed, in anything like large dosage. With them, it seems to have a special affinity for the cerebral centres, and to act less satisfactorily as a sensory paralysant when injected.

Hæmostatic Properties of Cocaine.

Cocaine, locally employed in surgical operations is a hæmostatic of the first order. It possesses this property by its action as a vaso-motor paralyser, the smaller arteries and capillaries being effected in the highest degree.

When applied in a strong solution, over the mucous-membrane of the more vascular areas in the body, it so effectually induces anæmia, that, on incision, scarcely any blood is lost. This is very beautifully demonstrated in the operations over the nasal-septum, or any district of the Schneiderian-membrane, when it is applied, by a swabbing of the surface. In consequence of the styptic property of the drug which, however, continues but a few moments, we must be on the alert, when we employ it, for secondary hæmorrhage, or a troublesome oozing, after the dressings are applied. But this seldom or never occurs, except in operations in the nasal cavities.

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CHAPTER VII.

TECHNIQUE OF ADMINISTRATION, WHEN TOPICALLY OR SUBCUTANEOSLY EMPLOYED, AS AN ANALGÆSIC, IN SURGICAL OPERATIONS.

As the action of cocaine, as an analgæsic, is very transient, not lasting more than twenty to thirty minutes, it is important that every preparation is complete, when we depend on this agent. It must be administered rapidly; and, after some definite method.

In plastic or other operations on any mucous-membrane, except the conjunctiva, or in the nasal-cavities, hypodermication must be conjoined with surface-applications.

Topical Application.

Cocaine solutions applied over a mucous surface should be of greater strength than when injected into the tissues. From a four to a ten per cent solution is required for this purpose; but, of this strength it should be used very sparingly. Perhaps, the only exception, when a solution of diminished density is required, is in the case of a sensative, irritable, or inflammed urethra. Many accidents have been reported

when strong solutions have been injected into this tubular structure.

When solutions, of any strength, have been injected into a passage, we should always be assured, that after a moments stasis, they are completely drained away. The lodging of pieces of sponge, gauze, or cotton, over an open wound, or mucous surface, is not a safe practice, when saturated with a strong solution of cocaine. As a rule, the safest and most efficient plan is to swab over the surface to be manipulated, with a well soaked pledget, and see to it that the residue is displaced before operative-measures are commenced. It may be sometimes necessary, in the course of an operation, to reapply the analgæsic, when much time is occupied, or sensation is not amply obtunded.

Hypodermic Use of Cocaine.

To accomplish the most satisfactory results, requires conditions, which have reference, to:

First, the *Individual.*

Seconly, the *Local Parts.*

Thirdly, the *Medicament Itself.*

Fourthly, *Its Mode of Administration.*

The Individual.

As the susceptibility to cocaine, varies, and the cumulative action of the drug, is never to be lost sight of, its administration is always rendered safer and the more effective, by the moderate ingestion of alcoholics; a little while, before the

operation, when there are no contra-indications. Our patient should have had ample, bodily rest, and when an extreme, nervous apprehension is present, a moderate dose of opium, taken the night before the operation, steadies and sustains the nervous system. The patient may have a moderate meal, an hour or so before our operative intervention commences, when the digestive organs are in good condition.

When we are permitted the selection of time, the morning hours are to be preferred, in this, as in all other classes of operations. My custom, with respect to the administration of alboholics, is to have it commenced about one or two hours before cocainization is begun. The sparkling, strong wines, or distilled liquors may be used, according to our patients choice, or the special circumstances of the case. Slight, moderate inebriation is an adjuvant of very great value, in cocaine operations. It not only aids, in inhibiting the sensorium, but it likewise serves, in enabling the system to resist the effects of shock, or loss of blood.

Cocaine, in lethal dosage, inhibitits cardiac and respiratory action, through the cerebral centers. This action is antagonized or minimized, by fortyfying the system with alcoholic stimulation, which antidotes this toxic property of the drug, by its well-known effects, on the cephalic ganglia. When, however, our patient has an aversion to taking stimulants, it should be respected, and they should not be forced on them; unless, such symptons arise, during the progress of the operation, as imperatively demand their use.

Individual Idiosyncrasies.

It should always be rembered, that certain individuals

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manifest a remarkable and dangerous susceptibility to various drugs. I have witnessed a case, in which, two-thirds of a grain of the extract of opium, brought on a mortal coma. I have known the same calamity follow, one-fourth grain of morphine; injection, hypodermically. Such accidents we cannot foresee, but, in the case of cocaine, hypodermically employed, we may forestall them, in most instances.

Many, especially females, will go into syncope, after the prick of a hypodermic-needle, or on seeing a little blood. It would be unfair, in these cases, to attach all the blame, for such mishaps, to cocaine; for, in many, not a drop of the solution, has entered the tissues, when our patient swoons away, in a dead faint.

In a considerable number, of so-called, cocaine accidents, I am inclined to believe, from the published descriptions of many of them, that they have been nothing more, than this phase of mental shock.

We will, in all instances, examine critically into the condition of the internal organs—the kidneys, heart and lungs particularly; and adopt such precautions, as will obviate serious symptoms.

The Medicament.

It is very probable that many of the mishaps and grave accidents which have occurred in hypodermication of cocaine, were attributable to an inferior septic solution, or a faulty technique.

When we are about to employ the alkaloid hypodermically, the solution should be made fresh, if possible. The water,

and the vial to contain the solution should be sterilized. It should be heated to about 100° F.; about the temperature of the blood, before injection. As a general custom, it is better to make our solution fresh from tablets, as needed, than to employ stale fluids.

Cocainized water promptly decomposes, unless hermetically closed in; therefore, when rendered septic, and injected directly into the tissues, contamination is almost certain to follow. Decomposed, stale solutions lose their potency, in a large measure, as analgæsics. This will often explain why hypodermic injections are often inert. The usual strength of solutions, for hypodermic employment, is too great and dangerous; and, is not any more efficient than those much weaker. For ordinary purposes, a one-per cent solution will suffice. One drop of carbolic acid, to the dram, will preserve the solution.

The general rule for the volume-dosage hypodermically employed, in the adult, is not to exceed that by the mouth; or, from one-eighth of a grain to two grains. In my own practice, I have very rarely had occasion, to use more, than the equivalent of one grain.

The syringe, used in the hypodermication of cocaine should have a long, strong needle. The larger the barrel, the better. One constructed of metal, for many obvious reasons, is to be preferred. This is all the more desirable, in a syringe of the required strength for cocainization, because much more firmness is required in an instrument used for this purpose, than in ordinary hypodermication; when, nothing more is needed than to send the liquid into the loose cellular tissues. But, in cocainization, we must often inject into very resisting

tissues, as the tendonous, ligamentous and cartilaginous. (Codman & Shurtleff, of Boston, Mass., manufacture the strongest hypodermic-needle in this country).

The technique of cocaine-hypodermication should be faithfully carried out, in all cases, if we would the more effectually inhibit sensation, over the operative area. The surface having been thoroughly sterilized, our solution at hand, the syringe is cleansed and tested; it is then charged, when we proceed to first make "a hub and a circle of spokes." This is what my good friend, Dr. Joseph Price, of Philadelphia, designates Réclus' radial, injection scheme. The needle is sent into the collar, when we simultaneously commence *two* movements. First, to slowly press down the piston, and secondly, to withdraw the needle, until the point arrives at the puncture, but does not come out through it; when the needle is again sent in, at another angle, and in a different direction; withdraw in the same manner, as in the first instance, and repeatedly introduce, until a considerable circle has been sprayed.

With this plan, by three or four punctures or "spokes" only, in the integument, a large area is cocainized. By making but few punctures through the skin, pain is much reduced. By the compound movement given the syringe, while injecting, and withdrawing at the same movement, we avoid depositing a large quantity at one place; and, should a vessel be penetrated by the needle's point, but a drop or two is sent into its lumen, instead of the whole syringefull, otherwise. Besides, it evenly sprinkles the needle's path in such a manner as to be more uniformly diffused through the tissues. In trivial operations, but one "wheel" is made; but, should we need to cover a considerable territory, we make several.

About thirty drops are needed in each puncture; from three to four drops in each radial furrow.

It is generally imprudent, to send the needle in very deeply, unless, we are preparing the border of a large tumor, or are about to deal with the osseous tissue. The skin and cellular membranes are the most abundantly supplied with the filaments, from the sensory nerve branches, so that, our aim should be, to as effectually, deal with these as possible.

When we are about to operate on the extremities, then we may, when our operation is to be very tedious, employ Corning's method of confining the circulation, and extending the period of the anæsthetic action of cocaine by passing the elastic bandage around the limb, above the operative area. This serves the double purpose of preventing the drug from entering the general circulation, besides, limits its local action. Our injections completed, the integument is kneaded for a moment; when the surface is *douched* with an ice-chilled syphon of carbonated water, where the primary incisions are to be made.

In all operations under cocaine hypodermication, except, those on the extremities, in which the diffusion of the drug through the general circulation is prevented by the elastic constrictor, we should make our incision and open into the tissues, very promptly, after our field is prepared. By this course, all excess of the alkaloid is washed away by the escaping blood, and the chances of its toxic action, reaching the brain centers are diminished. As the analgæsic action is comparatively short in these operations, in the suturing of an extensive incision, unless we are rapid in execution, much suffering will be borne by the patient, in our needle-punctures,

and the drawing of heavy catgut, or silk sutures through them.

The local condition of the parts, in all cases, requires special notice. Are they in a normal condition, or the seat of pathological changes? An active circulation, at the seat of operation, is a *sine qua non* in all cases. Therefore, it would be futile to inflict chemical solutions into inanimate, gangrenous tissues. In œdematous tissues, more of the medicament is needed than in the healthy.

Inflammation is no contra-indication to the hypodermic use of cocaine. The punctures are more painful, it is true, but, as there is an increased vascularization, analgæsia is more prompt here than in the normal tissues. It goes without saying, that a drug of the potent energy of cocaine, must be employed with care and discrimination; and, that its careless or injudicious employment may be attended with serious dangers. One of the most cogent objections against its employment, is, that through it, a heterogenous substance is admitted into the general circulation in varying quantities. That it possesses lethal properties is undisputed.

The toxic action of cocaine may be, as a rule, obviated if we exercise ample vigilance, and administer the drug in a diluted dosage. There can be no question, but, that the strength of the solution for hypodermic dosage as set forth in the current treatises on Materia-Medica, is too great. My own practice, was based on these directions, when I first used it; but it was unsatisfactory, and psychological phenomena, with toxic symptoms, were common, until I reduced the strength of the solutions, for injection, to *one per cent.*

The direction, to "wait for ten or fifteen minutes," is wrong, and may be followed by evil consequence. This delay

permits of the cocaine being taken up, by the circulation, acting on the nerve-centers, and producing *constitutional* disturbances; while the very essence of our claim for it, is, that its action is purely local. Accordingly, we must so adapt technique, that its action may be confined. With this object in view, in a moment after its injection, the surgeon rapidly makes his preliminary-incision, when the blood, from the peripheral vessels, washes away the surplus in the tissues. Nor, am I convinced of the accuracy of those recorded fatal cases, under cocaine injection; though, it must be admitted, that the dosage employed was dangerous.

Biddle ("Materia Medica and Therapeutics," XII Ed., p. 300) says, "fatal results have followed the injection of eighteen drops of a twenty per cent. solution into the urethra;" and, he adds, "that the smallest mortal dose recorded was eighteen drops of a four per cent. solution." The passage of an instrument, through the normal urethra, has been followed by promptly, mortal consequences, in catheterizing and sounding for a stone, when nothing, whatever has been injected. And, mortal shock has followed here too, even when pulmonary anæsthetics were employed. As the tendency to syncope and dangerous shock, is very great in different individuals, the fear of this haunts every conscientious surgeon, until his operation is performed.

There are *certain parts of the body and passages*, in which, as a rule, cocaine analgæsia should be eschewed. Any part of the anterior or lateral walls of the thorax, when punctured, commonly give rise to great and inexplicable shock. I have seen so many cases of the most dreadful collapse, after stilleto-wounds of the chest-wall anteriorly, that I would deem it a

dangerous procedure to make many deep needle punctures here.

The mammary gland in the female is rather more tolerant than other areas of the chest. The urethral passage is another, *noli me tangere*, for cocaine, as a general rule; but, when proper precautions are employed it should not daunt us. In my own practice, I have never had any mishaps in urethral surgery and, in spite of what has been written against it, I must uphold this priceless agent, for many purposes in the surgery of the urethra.

With the female sex, and in young children, the hypodermic employment of cocaine,is not so satisfactory as with adult males. Children are timid and frightened, making great resistance to the punctures; besides, it is said, like opium, in childhoood, to produce cumulative symptoms. With hysterical women, unless we operate very promptly, the drug produces marked excitement, though, in the average case, its effects are most gratifying. The common gravamen, of the female sex, is the pain of the injection, the needle puncture, etc., consequently, the field of operation should be concealed from their views, and the needle punctures, rapidly made. It has been charged, against hypodermic analgæsia, that in many, intense pain is borne at the seat of incision, after its effects pass off. This may have been the experience of certain operators, but they are rare; and, but few such cases have been reported. We may notice the same phenomenon after ether or choloroform in highly sensitive individuals. But, a more serious objection, if it could be substantiated, has been advanced. It has been thought, that in consequence of the vasomotor-paralysis, which it induces, that it impairs the nutrition of the

parts, at the seat of operation, and greatly retards reparative processes; that primary union is uncommon; that there is a proneness to suppuration; and in operations on the eye, to ulceration of the cornea, and a chronic congestion of the choroidal vessels.

It is the experience of every one accustomed to perform surgical operations, that at times, for some unaccountable reason, the results are unsatisfactory; wounds may take on a chronic course; a constitutional irritability may follow, and union may be slow and imperfect. Any new remedy, or innovation in surgical therapy, by many is regarded with suspicion, and we are sceptical of its value till it has been thoroughly tested. This has been the history of the most valuable agents we possess. Many take up cocaine, with a deeply-rooted prejudice against it. With these, every shortcoming or mishap is exagerated or magnified, and, if miracles are not realized, they fiercely condemn the new agent. With one's first experience with a drug, until we are familiarized with it; especially one requiring the precision of detail, demanded in cocaine-hypodermication, if we fail at our first trial we are apt to prematurely cast it aside. Certainly, in my own cases, which embrace a large variety of operations in different regions of the body, on various tissues, the healing processes have been, in no manner, impaired or delayed.

CHAPTER VIII.

SURGICAL OPERATIONS IN WHICH HYPODERMIC COCAINIZATION MAY BE EMPLOYED WITH ADVANTAGE.

Professor Herman Knapp, in his brochure entitled "Cocaine and Its General Uses in Ophthalmic and General Surgery," declared, that "no modern remedy has been received by the profession with such great enthusiasm; none has become so popular, and scarcely any has so extensive a field of useful application, as cocaine, the local anæsthetic recently introduced by Karl Koller, of Vienna." This author avows, that his contribution is not written so much for the purpose of reporting what has been accomplished in various hands, as to stimulate others to make new investigations. This eminent surgeon experimented on his own person by making injections into his own urethra, etc. He tell us that he removed painlessly, a deep-seated aural polypus with cocaine, in a perfectly painless manner.

The following are some of the experiments and views of different authors, writers and operators, collected by Dr. Knapp:

Dr. W. J. Hepburn (*Medical Record*, Nov. 15, 1889), "injected six minims of a two per cent solution under the skin of the arm. In forty-eight minutes he made eight such injec-

tions, Immediately, there was an accelleration of pulse and respiration; an agreeable warmth, moderate mydriasis, slightly crossed diplopia, agreeable hallucinations, with the eye closed, disappearing when they opened. Impairment of cutaneous sensability, and a sense of walking on a cushion, a tendency to walk on the heels; a sensation on grasping an object, that something intervened between it and the hand. Two other experiments had the same results."

This experiment of Hepburn's was a singularly valuable one, and a few features of it, just here, are worthy of special note. It will be observed, that he made the injections in a very leisurely manner, covering four-fifths of an hour; that he injected nearly a grain, and that toxic symptoms were well pronounced. It will be noted, too, that all that was injected remained in the circulation.

Should such sequellæ occur in general surgery, by cocainization, they would constitute a very grave objection to it, but as has been observed, when we employ cocaine hypodermically, as a surgical analgæsic, we must be ready to operate promptly, after the drug has been sent into the parts, and that the surplus of the solution is washed away by the blood, escaping from the divided tissues. It produced hallucinations, agreeable sensations, etc. Some have gone so far, as to declare that it may cause insanity. But there is no proof, in any well-anthenticated instances, that I can find of such a condition; that could be clearly, charged to the drug, when employed only for surgical purposes; though, we are all acquainted with the curse of the cocaine habit.

Without doubt, mental derangement may have followed certain operations in which cocaine has been employed, but

that proves nothing; for we know also, that there are operations on certain regions, very commonly followed, by the most marked psychological disturbances when ether, chloroform, or even no anæsthetic at all, is employed.

Dr. Sears, in a recent issue of the *Boston Medical Journal*, considers the question of insanity, following surgical operations, and has collected 185 cases of all kinds. Sixty followed gynæcological operations; ten followed amputation of the breast; sixtytwo resulted from operations on the eye; while forty-five belonged to the domain of general surgery. In a list of cases collected by Kiernan, sixty-five followed gynæcological operations, and thirty-five cataract operations. I have elsewhere called attention to peculiar phase of persistent melancholia, which I have observed, after operations for the radical cure of reducible hernia.

Dr. Knapp tells us that Drs. A. H. Smith and S. D. Powell, of New York, employed cocaine with good results on the urethra; that Von Rambdor operated for vaginisums with it; that J. W. Mitchell employed it with advantage in venereal operations; that Cabot, of Boston, used it in urethral surgery.

Dr. F. N. Otis, of New York, says, that he used it with great advantage, in cases of stricture, enlargement of the prostate, irritability of the urethra, stone in the bladder and ulcer of the rectum.

Dr. W. H. Doughty operated successfully with cocaine for vesico-vaginal fistula.

Bosworth, of New York, has employed it in rhinological, and other operations in the pharynx and larynx.

Dr. E. L. Keys has extensively employed it, in urethral surgery. He says, that it seems to spend its energy on the

anterior urethra rather than the deep, and on the peri-urethral tissues.

Polk has employed it in vasico-vaginal fistulas. The alkaloid, it appears, is highly appreciated as a valauble adjuvant in surgery, on the Pacific Coast.

Dr. S. O. L. Potter, of San Francisco, Cal., says ("Pharmacy and Therapeutics," IV Ed., p. 217): "Cocaine has achieved a notoriety as a local anæsthetic, and promises to be of the greatest value, in many operations on the eye, ear, nose, throat, uterus and urethra."

Lauder Brunton, speaking of erythroxolene, in his valuable work on "Pharmacology and Therapeutics," says: "The expectations of the practicability of cocaine, founded on a knowledge of the physiological action which Rossbach expressed, has been completely fulfilled, and it bids fair to replace, as an anæsthetic, chloroform, in many minor operations."

Potter and Brunton, evidently had not familiarized themselves with the contents of Réclus' brochure, at this time, or they would have learned that cocaine is equally as valuable in as many major, as in minor operations.

A host of operators the world over, can testify to the infinite value of cocaine analgæsia; but, even now, a want of knowledge of its use; timidity, prejudice and sentiment, have confined its employment, within too narrow limits.

Alcohol, ether and chloroform, it is said, are antidotes to cocaine, when toxic symptoms appear. How much they antagonize its lethal action, I cannot say, from experienca; but, to my mind, the aromatic diffusive stimulants, as camphor, musk and ammonia, would serve a much better purpose in

arousing the patient, and overcoming the paralysis of the reflexes when an antidote is called for. Cold-douching of the face, hot applications over the precordia, electricity, plenty of fresh air, friction, the "*procéde de la langue*" of Le Fort, used in asphyxia or sudden apnœa, from any cause, many be utilized with advantage.

The Advantages Which Cocaine-Hypodermication Offer in the Manual of Surgical Operations.

First, As to the price of the drug itself. Cocaine, to the profession, costs but a few cents a grain, and kept dry, in a tightly covered vial, does not deteriorate with time. The cost is a small item; yet, it is worthy of notice.

Second, With its use, we may dispense with assistants altogether, in many operations; and, in others, reduce their number. This is an important matter, as in many cases, assistants may be difficult or impossible to secure; or perchance our patient is without means to compensate them. Indeed, as Réclus puts it, our patient becomes the most valuable assistant himself; moving and shifting his body in any position we may direct.

In a village or scattered neighborhood, when one is called in the night, and our case will not admit of delay, to send long distances for assistants, it is often a priceless boon.

Third, By the intelligent employment of cocainization, in oral surgery, or the surgery of the nasal or buccal cavities, the operative technique is greatly simplified, and the danger of sucking blood into the air-passages is entirely obviated.

Fourth, In-opportune retching, straining, vomiting, bron-

chorrhœa, expectorating, hysterical screaming, and groaning are all wanting.

Fifth, There are none of the violent, bodily struggles and resistance, so often seen in the excitement stage of ether anæsthesia.

Sixth, Tetanic, tonic, or clonic spasms, violent, muscular contractions, and plunging of the extremities are absent.

Seventh, The patient suffers none from post-operative, gastric disturbance, so general, after ether or chloroform.

CHAPTER IX.

REGIONAL AND ANATOMICAL DIVISIONS OF OPERATIONS FOR COCAINIZATION.

First.—Operations on the Head.

Second.—Operations on the Neck.

Third.—Operations on the Trunk.

Fourth.—Operations on the Extremities.

Fifth.—Operations for Traumatisms, and Pathological Conditions.

Head.

Chief, among the conditions of the head, requiring operative intervention, is fracture of the skull, or suspected fracture for which incision is made, to expose, and elevate the bone, or for purposes of exploration. The skull is rarely, if ever fractured, without the brain participating in the consequence of the trauma; although the lesion need not necessarily manifest itself, by cerebral symptoms.

Now, it is well known that etherization is always attended by active cerebral congestion and hyperæmia of all the superjacent tissues. I have often watched the phenomenon of expansion of the brain, through an aperature in the vault, and I have seen the convolutions rise, flatten out and fill the cranial

cavity, as the ether inhalations were pressed to full coma; then noted, as anæsthesia passed off, how they receded away from the inner table.

In fact, cerebral hyperæmia is an essential part of pulmonary anæsthesia. But, can we induce this state when the brain is damaged by injury, with impunity? Does it not rather, favor the prospects of meningeal inflammation, supervening, or retard reparative processes? May it not induce cerebral-hernia, through favoring protrusion of brain-substance, in the direction of the least resistance, when the dura-mater is opened by accident, or the surgeons scalpel?

At all events, it gives us a bloody field for operations, and the vomiting or straining, which it induces, may cause a secondary hæmorrhage, through disturbances of the wound.

In properly seleeted cases of gun-shot injuries, or fractures of the skull, cocainization is a most useful procedure. The cases of this class, in which the best results are realized, are:

First, Those in which the patient is not rendered insensible, by the injury.

Second, Those which mainly occupy the vault.

Third, Those, in which we are assured, that the operative manual will be brief.

Fourth, In adults, when delerium is absent.

Technique of Cocainization, in Skull Injuries.

The scalp is first entirely shaved and cleansed. This should always, when it is possible, be done in the ward, or before the patient is placed on the operating table. In skull

injuries, we deviate from the usual routine in our preliminaries so as to entirely omit the administration of alcoholics. The scalp is a tissue, easily cocainized; besides, as we wish to prevent cerebral congestion, we deliberately avoid the use of stimulants. The patient, now in position, we may or may not encircle the head with in Esmarch's bandage. In my own practice, it is seldom employed here. Its application is painful. In young subjects, the communication between the larger meningeal vessels, through the diplœ to the scalp, is so complete that this will not produce complete hæmostasis.

A circle, from four to five inches in diameter, may be easily cocainized in the scalp with 60 or 70 drops of the standard hypodermic solution. Here, it will be noted, that the anatomical conditions favor prompt and efficient action of the hypodermic. The scalp rests on the bony wall of the skull, so that, not like, in many other situations, there is less chance, of the liquid penetrating downward into the deeper tissues. The scalp is very vascular, and hence, the diffusion of a medicament through it is very rapid.

Our solution injected, we douche the surface with a refrigorant, and in a moment proceed with our primary incision. The scalp alone, in the absence of inflammation, is the only covering of the dome of the brain, highly endowed with sensation. We effectually benumb sensation in the tissue when the way is clear for the painless completion of our operation. The division of the occipito-frontalis tendon, its underlying fascia, the pericranium and plates of the skull, give no pain, as we penetrate them.

The scalp tissue being well retracted, and the pericranial membrane being well drawn aside, we are on the depressed

bone. Now, at this stage, in former times, we would take up the trephine and drill out a disc of bone. But, for a long time I have cast the trephine aside altogether in this class of cases, as a dangerous and complicated instrument, liable to get out of order, and in its application damaging to the dura-mater. Instead, we now employ osteotomes (square and bevelled chisels) and the mallet. In other words, we substitute what the French designate *debridement* for trepanage. In the hands of one of ordinary skill, this is a safe, simple and prompt means of elevating the fragments of crushed bone. The depressed bone removed and the wound cleared, we are ready to replace the soft parts. Usually, before this is completed, the analgæsic effect has passed away, and our patient complains only of the needle points as they penetrate the scalp.

Illustrative Cases.

As examples of the different types of cranial lesions, it may be well to cite a few cases, in abstract.

Case One.—*Compressed and Depressed Fracture of the Skull, of Four Years' Standing.*—Patient, male, 48 years old, was injured four years previously by being struck over the vertex, with a falling brick. He said he had considerable bleeding, at the time of injury, and went to a physician, who bandaged his head, and ordered a lotion. The wound healed, but two years later it re-opened. He now went to a physician, who sent him to a hospital. Here he was told that there was dead bone in his skull, and that he must take ether in order to have an operation performed. But, as he had a fear of ether,

he refused, and left the hospital. Finally, as the opening in his head had become a great source of irritation, he applied to the Harlem Hospital for admission and treatment. He was assured here of a painless operation, without ether.

The head was shaven and prepared, and two hours after he had eaten a moderate dinner, he was placed on the operating table. About two inches, anterior to the occipital protuberance, directly in the median line, squarely over the longitudinal sinus, there was a depression of the bone, indenting the brain in such a manner, that one could pass the middle finger down from the level of the skull, nearly an inch. At the bottom of this pit, there was an open sinus, through which a probe was easily passed, on to nude, necrosed bone.

This was thoroughly cleansed and dried, when a small pledget of lint, saturated in a four per cent. solution of cocaine was loosely packed in the cavity, while hypodermication was being carried on over the integument above. In a few moments everything was ready, the skull was denuded, an opening made near a lateral fissure with the chisel, when an elevator was introduced and a fragment started. Now, with the aid of a forceps and rougeur, the work of cleansing away the diseased bone was rapidly accomplished. As the dura mater was exposed, it was, in different places, gently pressed with a probe, but the patient was scarcely conscious of any sensation, and had no sense of pain from the pressure, he said; though he could feel the scalpel pass through the tissues and the retractors penetrate the scalp; but, there was no suffering whatever. He made a good renovery.

CASE TWO.—*Compound Fracture Through the Frontal*

Bone.—Patient, male, 60 years old, was struck in a brawl, and knocked down. Was dazed by the blow, and unable to rise. Was taken to the station-house on a stretcher, and an ambulance was called; when, he was brought to the hospital; intoxicated and boisterous, when admitted. Wound was dressed, he was given an anodyne and placed in bed. He passed a quiet night. The next afternoon, when consciousness was restored fully and reaction was well re-established, he was placed on the table for examination, and treatment of the fractured skull. The tissues were torn widely open, and shattered bone came into view, as one of the loose flaps was pressed aside.

After the lacerated tissues had been carefully sterilized, the bleeding was subdued, and the wound dried. Hypodermication was commenced, and sixty drops injected. While this was being done, a piece of cotton gauze, moistened with cocaine solution, was stuffed into the wound. Cocainization completed, a syphon of ice-chilled vichy was spurted over the traumatized surface. Now, a long, crucial incision was made over the traumatized area, and the osseous surface of the skull exposed. It was now seen, that the frontal sinus was opened by a fragment of bone from above the supra-orbital ridge, which was driven inward. This fragment was removed, the edges of the portal now made, were trimmed, the overlying integuments replaced and sutured. The patient at no time complained of any pain. His ultimate recovery was rapid.

CASE THREE.—*Concussion of the Brain, With Suspected Fracture of the Skull.*—Patient, a carpenter, fell from a staging, a distance of about thirty feet, landing on a pile of bricks. He was raised in an unconscious state, and brought into the

hospital in an ambulance. I saw him the day following admission. He now had possession of his reason, but complained, at this time, of some dizziness.

A little above, and anterior to the tempero-parietal junction, there was an apparent, irregular depression, which had some of the characters of a depressed fracture of the skull. As there were no urgent symptoms, a temporizing course was adopted. After four days, as the parts at the seat of the injury still presented features indicative of fracture, we decided to cocainize the scalp over the traumatized area and explore for fracture. In this situation it will be noted that the skull is partly covered in by the temporal muscle, and is more deeply situated from the surface than at the vertex.

The case was treated essentially on the same lines as the previous ones, as far as cocainization was concerned; the bone was denuded by a very tedious detachment of many fibres of the temporal muscle; but no fracture could be detected. The analgæsia worked perfectly. Our field of operation was quite anæmic, the head motionless and no resistance offered. The second, though one attended with an extensive laceration of the tissues, was closed without drainage, and healed by primary union.

In my service at the Harlem Hospital, within the past three years, more than twenty fractured skulls have been treated by cocaine analgæsia, in operations on them. It would be useless to occupy space in rehearsing them here, as it is enough to know, that in the majority of cases of cranial fracture in the adult, the hypodermic use of cocaine wholly obviates the necessity of employing any sort of anæsthetic inhalation.

If it has any special lethal properties, when employed in

such close proximity to the brain, I am unacquainted with them. It is easy to conceive of cases of this description, in which sudden, serious symptoms might develop, and the drug be wrongly condemned for them.

On July 16, 1893, Dr. James H. Bache, of this city, came for me in a great hurry to go and see a patient of his, a lad of 16 years, who had accidently shot himself; the ball penetrating just above the left supra-occipital ridge. At my house, I suggested that we employ cocaine for an analgæsic, but the doctor was sceptical of its powers. The wound had produced no immediately grave symptoms, and the boy was sitting up, with full possession of all his faculties, when the doctor came for me. I told him that it would take about an hour for me to prepare and reach the house. When I arrived there, the lad had suddenly, been seized with violent convulsions, so that the doctor was obliged to administer chloroform to overcome them.

While he was in this state, I extracted the ball, which was lodged between the dura-mater and the inner table. Passing my finger over the dura, I noted a total absence of brain pulsation, which clearly indicated a sanguinous effusion; probably from some of the lacerated cerebral vessels. This accumulation of blood, no doubt, by intra-meningeal pressure, caused the violent spasms and loss of consciousness. The unopened dura crowded into the bullet opening in the skull. The boy came out of coma towards morning and has since made a good recovery. But, had I, unluckily, injected a few drops of cocaine solution, before the boy was seized with this violent convulsion and coma, the fiercest maledictions would have been hurled at me, and had he died in the stupor, the drug might have been held accountable for the boy's death.

CHAPTER X.

PATHOLOGICAL CONDITIONS OF THE SKULL AND BRAIN, IN WHICH COCAINE-ANALGÆSIA IS EFFICACIOUS IN SURGICAL OPERATIONS.

There are many lesions of the skull and brain, other than those of a traumatic origin, which are ameable to surface anæsthesia, when surgical intervention is demanded.

Six years ago, a young man came into my service, at the Harlem Hospital, who had a scalp wound only, as was supposed. This was dressed, in the usual manner, when he was dismissed. Two weeks later, he returned with an ulcerated sore at the former seat of the laceration, and under this, the bare bone could be felt with the probe. He had a severe headache, great tenderness over the seat of the wound, bodily weakness, chills, thirst and fever. It was now decided to cocainize the inflamed indurated tissues at the seat of injury, and explore; for, the symptoms all pointed to deep suppuration and septicæmia. The scalp was prepared in the usual manner, and cocainized. As the scalp flaps were rolled away, we came on a linear fissure on the skull, through which fungous granulation projected, and pus oozed. When a one-inch area of the cranial surface was exposed, a small trephine

was taken in hand, and a button of bone sawed away. This brought us down on a large pus formation, lodged between the dura-mater and the skull. The cavity was evacuated, flushed and drained, and dressing applied; analgæsia of cocaine serving, most happily, to annul all painful sensations, and our patient making an uninterrupted recovery.

On July 16, 1893, I operated under cocaine, with the utmost satisfaction, in a case of mastoid abscess.

Patient was a hearty, vigorous lady of 30 years. She had been suddenly seized with violent pain in her right ear. This had been treated by two practitioners, with the usual paliative measures when she came into my hands. After vainly trying different tentative expedients, and finding everything pointing to deep-seated suppuration, near the base of the brain, in the mastoid elements, I urged operation under cocaine. At this time, her general condition was becoming very serious. She had incessant neuralgic pains, pyæmic symptoms, loathing of food, no natural sleep, profound anæmia, and little strength. Her great dread of operation was of taking the ether; this, she had a horror of, yet she demanded an assurance that we would not give her any pain, for the mastoid district was as sensative as a ripe phlegmon. As a preliminary in this case, good French brandy was freely given for an hour, before operation.

With one assistant, preparations for operation were begun; in the meanwhile, a table spoonful of brandy was given every fifteen minutes, as the time approached for division of the tissues. Now, with the side of the head shaved and sterilized, hypodermication was begun. The point of the needle was sent deeply into the indurated tissues, until it passed under the

pericranium, when the spraying of the inflammed area commenced. Cocainization and refrigoration completed, the tissures were painlessly stripped from the bone, when the small trephine was engaged in the osseus elements of the mastoid.

The bone was as dense and as compact as ivory; hence, the process of drilling was tedious and difficult. But at length the vitreous plate was penetrated, and a mass of foul-smelling, greenish, cheesy pus exposed. The trephine opening was enlarged with the rougeur, the bony pus-cavity scraped, and flushed with antiseptic solution. At no time was our patient conscious of pain. Her recovery was tedious, but it has been complete.

This was a typical case of cranial surgery, in which to test the full value of cocaine-analgæsia. The operative area was in a state of acute inflammation, the seat of disease was deeply lodged, the technique was complicated and tedious; yet, never has the drug more completely fulfilled its purpose, than in this lady's case.

CHAPTER XI.

LOCAL ANALGÆSIA IN HÆMATOMATA, SMALL NEOPLASMS OF THE SCALP, IN SUSPECTED CRANIAL-FRATURES AND BRAIN LESIONS.

It has become a well recognized practice, in modern times, to cut down on and clear out blood-clots or effusions of blood under the scalp, rather than to treat such cases on the old lines, when lotions were applied, bandage pressure was employed, and they were disposed of, by the more tedious process of disentegration and resorption.

For many reasons the modern method is much to be preferred in all cases, provided the hæmatoma is large and rigorour asepsis be employed.

Everyone who has had anything like an extensive experience in scalp or skull injuries, is familiar with the peculiar cup-shaped depression which we so often find in those simple hæmatomata following a blow, in full, on the head. The hard, elevated margin, which, takes a different outline in various cases, so simulates a depressed fracture of the skull, that in all such cases attended, particularly, with cerebral symptoms, the inexperienced, or hasty may, on finding this depression, assume that there has been a fracture. But, the fact is, in the

majority, there is no fracture; and, as resorption advances, this deceptive ridge wholly disappears.

Nevertheless, in a certain proportion, when the base of the blood tumor presents the same identical, visible, and tangible qualities, the skull has suffered a depressed fracture. Hence, by opening these freely, in all cases, we are enabled to explore the cranial surface, at the seat of the injury and determine whether we have a simple or grave lesion to deal with.

The clot is displaced, all bleeding subdued, the sterilized scalp-surfaces are closed, without drainage, prompt reunion follows; and, in simple cases, we secure results in days, which heretofore accupied weeks. In this class, the hypodermication of cocaine, renders operative interference a safe and simple procedure.

It is quite enough, here, to simply cocainize only the line of incision; and, twenty or thirty drops are ample. But, in all this class of cases, let the scalp be cleanly shaven, scrubbed and sterilized. It is well, in all cases, to cleanly denude the scalp of hair, for at least four inches wide of our line of incision; because, this is a substance very difficult to cleanse; and, besides, as the vascular and lymph spaces of the scalp and dura-mater are continous through the diploë, in the event of infection, our patient's life is placed in great jeopardy. As the brain in all these, has suffered more or less contusion, the same advantages for cocainization, hold good, as in the average skull fracture.

Local cocainization is ample, to efficiently deaden sensation, for the enucleation of chalazia, or fatty tumors of the scalp.

The hæmostatic properties of the alkaloid, aid in produc-

ing an anæmic field; so that, in simple growths, with narrow bases, time is permitted us, to turn them out and suture the divided edges before sensation has returned. Notwithstanding, what may be said to the contrary, it is my practice not to disturb the surface of the skull, and drill through, to treat a fracture, unless the extent of depression of the fragments is considerable, or there are cerebral symptoms present. But, this is not the place, to consider the controversional side of the question.

In all cases, in which there are reasonable grounds for suspecting fractures, an incision will do no harm, and in the event of a litigation following the injury, we are able to state with considerable precision the exact quality of the lesion.

It may be added here, parenthetically, that the flat bones of the skull are the only ones in the body which, as a rule, permit of an incision through the soft parts, for purposes of diagnosis in cases of fracture.

By hypodermication here, there are many cases in which diagnosis may be verified which, otherwise, must remain in doubt. Many have such a deep-rooted prejudice against pulmonary anæsthetics, in any form, that they will rather take chances than submit to their administration. But, it is well to remember, that though the technique and execution, in the major part of those exploratory operations on the skull, occupy but a few moments, yet, in every case the most minute particulars must be observed, in our preparations, to promptly staunch hemorrhage and sterilize the parts.

Local anæsthesia is amply efficient in certain pathological conditions of the skull and brain.

In those large, tedious, trephine operations, undertaken to dislodge neoplastic formations within the skull, a general anæsthetic must be employed. But, to deal with a limited, superficial necrosis, a traumatic abscess of the brain, located near the surface, or an abscess of the frontal or mastoid sinus, we now possess the agent to deal with them, which renders general anæsthesia in all, but exceptional cases, quite unnecessary.

In all this class of cases, as the soft parts overlying the seat of lesion are hyperæsthesic, we are compelled to call into action, all our accessories, in the way of chilled surface-douching, and moderate inebriation; besides, carry our dosage of the analgæsic to its maximum, before we attack the inflammed and indurated tissues.

CHAPTER XII.

LOCAL ANALGÆSICS IN THE SURGERY OF THE FACE AND ITS CONNECTING ORGANS.

The analgæsic properties of cocaine were first utilized in ophthalmic surgery, and here, it has its widest limitations. Its wide range of application in the ocular region is fully set forth, in all modern works which deal with this special branch of the healing art; and, hence, as it is intended here, to only deal with the subject as it concerns the general surgeon and family practitioner, it will be referred to in this connection, only, with such common, simple and everyday-conditions, as we are commonly called on to treat.

As an aid in subduing sensation for the removal of foreign bodies from the cornea, cocaine possesses unrivalled power. Its action in this locality is almost instantaneous.

Our patient comes to us with the most intense orbicular spasm, photophobia, and pain. A fragment of coal, or other hard substance, is deeply imbedded in the cornea, and the eye incessantly rolls on its axis in every direction, rendering it quite impossible to fix it, and extract the foreign body. We separate the lids and instil a drop or two of a four per cent. solution of cocaine; when, almost at once, as if by magic, the

whole scene is changed; our patient opens the lids, and fixes the eyeball; now, as senseless to pain as a dead man's.

We take up the spud or needle, and with as much leisure as we desire, we penetrate the epithelial and parenchymatous layers of the cornea. Though, in a dexterous hand, extraction is but the labor of a moment, the analgæsic lingers a considerable time; longer, on the cornea, it has seemed to me, than in any other tissue of the body. It is well to know that cocaine is a powerful mydriatic; and, along with annulling sensation, it at once paralyzes the accommodation. Therefore, it is always well to inform our patient before he leaves us, that his vision may remain more or less disturbed for some hours.

In the surgery of the nasal and buccal cavities cocaine displays some of its greatest triumphs. In surgical procedures on the periphery, near the muco-cutaneous junction, at the nasal or oral portals, it is simply superb.

Operations on the borders, or within the nose or mouth, have heretofore been a veritable *beté noir.*

After the operator passed the alveolar arches, his difficulties commenced. Space for manipulation is very narrow, the parts are extremely vascular, and on incision of the tissues, blood flows in every direction, choking up the air passages, draining into the stomach; besides, it covers the operative field. In vain, the surgeon endeavors to mop away the accumulating fluid.

By fits and starts, the patient struggles, vomits and blows the streaming current, into the face of the operator, and far away over the walls and furniture.

Necessarily, in nasal, oral or labial operations, as soon as manipulations are begun, when pulmonary anæsthetics are

employed, the ether cone must be removed. Hence, unless, the operator be unusually dexterous, skilled and rapid, before he can complete the operation, his patient is coming out of ether; perhaps, at just that stage, when absolute quiesence is imperative. Now, he must either stop here and leave the operation incomplete, or else force the anæsthetic, while the patient is swallowing, or inhaling blood into his lungs in great quantities.

But, even assuming that hæmostasis is fairly efficient, after our operation is complete, when undisturbed rest and efficient asepsis are important; as soon as etherization or chloroformization is over (for both are similar in this respect), our patient becomes halarious, shouts, screams and cries; besides, in most cases, has free emesis, thereby deranging the wound and befouling it with the acrid contents of the stomach.

Recently an endeavor has been made, to overcome some of these difficulties, by tapping the trachea and etherizing through a cannula, inserted through the opening. Leakage into the cervical canals is prevented by stuffing the pharynx with gauze. This scheme lessens the dangers of infection of the wound and pulmonic inflammation; but, it adds fresh ones; for, the opening of the trachea is no trivial affair; and, further, though all ultimately succeed, a stenotic contraction of the windpipe, with an impediment in the voice, is almost sure to follow, in every case.

A few years ago, since cocaine has come into use in surgery, it was my privilege to attend the clinic of one of the few survivors of that generation of great operators who have pressed far to the front, by brilliant achievements, the claims of American Surgery. He was about to perform an operation

on a middle-aged man, for an epithelioma of moderate size, from the middle of the lower lip.

Before commencing the operation, while the anæsthetic was being administered, he warned the students, that in operations of the description which he was about to undertake, it was always necessary to be guarded in administering an anæsthetic; not to carry it to full narcosis; but, rather carry the patient to the border line, only; so that, should the escaping blood accumulate freely in the mouth, the patient would be conscious of it and hawk it up; thus, in that manner, preventing its entrance into the air passages, and a septic pneumonia following.

He added, that in that class of operations, danger was rather to be feared from this source, than from the operation itself.

That admonition was timely and wholesome, for a bygone age; but, in our time, with the facilities at our command, to effect complete hæmostasis, and temporarily annul pain over local areas, it was quite superfluous.

Let us see what hypodermication of cocaine can do to render this one of the simplest operations in surgery.

First, our patient is cleanly shaved, and the lip sterilized as completely as possible.

Next, the usual quantity of alcoholic fluids are given, while preparations for the operation are being made. When all is ready, our patient is placed, sitting in a strong arm-chair; and, while an assistant or nurse supports the head, the operator proceeds.

The first step, is to carry a strong silk suture through, under the surface of the angle of the mouth, from within out-

ward. Now, a small pledget of lint is fixed between the upper surface of the lip and the suture, when this is securely fastened at each angle, in a sliding knot. Cocaine solution is now injected, according to the general rule previously set forth. Our operative field effectually benumbed, we are prepared to proceed; but, let us pause a moment, and consider what we have accomplished so far. Well, we have shut off, with our temporary transfixon-ligature, the inferior-coronary-arteries, the chief nutrient feeders to the lower lip. At the same time we have held back the veinous current; and therewith, by confining the circulation, intensified the action of the cocaine. Accordingly, we have practically a dry field and painless surface, to deal with.

This stage reached, the remainder may be completed, without any assistance at all, if desirable. There our patient sits, looking the operator in the face. We have from twenty to thirty minutes now to perform an operation, which any tyro should go easily through in half that time. There will be some parenchymatous oozing of the blood, but no spurting. As the blood accumulates in the mouth, the patient, now and then, spits it into a cuspidore, pail, or whatever is most convenient. In a few moments the operation is completed. There has been no strangling, struggling or vomiting.

Dressings are applied, when our patient rises and walks to his bed or ward, or goes home, if he wishes. There seems no good reason, why this operation should not be performed in one's office in mild weather, and the patient allowed, with an attendant, to make his way home, after he has had a little rest; for the shock following is nothing, compared to the extraction of a deep-rooted tooth.

Operations Within the Buccal Cavity.

Hypodermication, or the surface application of cocaine, will suffice, for any description of surgical intervention, external to the pharyngeal isthmus, except those, which involve the osseous and dental substance, in adults. Perhaps, an excision of the tongue may be an exception, though, there seems no reason why it should not succeed here, provided the operator is rapid in execution, and complete analgæsia is effected.

Therefore, in all adenoid growths, superficial neoplastic formations, urano-plastic operations, and a great variety of other pathological conditions, it wholly displaces pulmonary anæsthetics, and at once, renders many, hitherto, very bloody, difficuft and tedious operations, safe and of easy performance. The experienced laryngologist, by the moderate surface application of a four per cent. solution of cocaine, is enabled to readily penetrate and explore the sinuous recesses of the larynx; painlessly remove vegetations and excrescences, apply the galvano-cautery, or other therapeutic agents.

The naso-pharynx is rendered readily accessible to manipulation, for the removal of surface growths and treatment of granular inflammation of the mucous membrane.

If we are about to open a post-pharyngeal abscess, or, one lodged in either tonsil; a slight mopping of the surface, about to be penetrated by the lancet, will annul all pain-sense. In urano-plastic or other operations on the palatine-vault, local analgæsia in the adult, renders these comparatively bloodless, and greatly reduces the difficulties, in the way of their performance.

In December, 1893, a young woman was sent into my

service at the Harlem Hospital for the purpose of having an operation performed on her palate. On examination, it was found, that she had a large perforation in her soft-palate; which, was of such extent, that it would nearly admit the tips of two fingers. She confessed to having had syphilis. This immense hiatus had rendered articulatiou indistinct; besides, gave to the voice a decided nasal twang, so that, it was quite impossible to understand her. Along with this, the nasal secretions were constantly falling into her mouth; and, when she ate soft food, it escaped, through the breach above, into her nasal passage. As the operation, required here to fill this immense hole, would require an extensive and cautious dissection, besides considerable bleeding, when the time for it arrived, it was decided that pulmonary-anæsthesia must be necessarily very intermittant; and, as the danger of sanguinous leakage into the trachea was imminent, ıt was determined to attempt the operation without any sort of an anæsthetic. She was reconciled to bear any degree of pain, provided a hope of cure was held out. The operation was undertaken at a clinic, in the presence of several visiting practitioners and the house staff.

Our young woman was possessed of marvellous fortitude, and bore up with great determination, but, in spite of all this, as the periosteum of the palate was denuded, when the bleeding points were pinched up by the clamps, and the needle penetrated sensative areas, the head was involuntarily jerked in every direction. Thr parts were terribly vascular, and, with the alternate fits, of choking, and spasm of the glottis, she besmeared every one about her. She was soon seized by at-

tacks of syncope, and alarming symptoms of prostration set in. The operation was a humiliating failure.

The best that could be done was to secure the bleeding points, and leave the gap unclosed. Our unfortunate patient was returned to bed.

Every day, for two weeks, the mouth was rinsed with a peroxide of hydrogen solution. As she recovered her lost strength, she again appealed to me to make another endeavor. After having again carefully studied the case, we decided to once more make an effort, to remedy the defect, by another operation.

Again the nasal and oral cavities were carefully sterilized; when all the tissues about to be denuded in paring the borders and for flap-sliding, were first, freely injected, with a one per cent. solution of cocaine; after which, the surfaces were dried and a four pent. solution of cocaine freely mopped over them. Now, with the jaws well gagged and everything in readiness, operative measures were begun. The transformation scene after this species of analgæsia was adopted, was so great that one who was not a witness, could hardly realize it.

Never, in any region of the body, have I seen such magnificient results from the action of this truly wonderful agent. The field was almost free from hemorrhage.

Never did I see the hemostatic action of the drug more manifest than in this instance.

The extensive mutilation required, to obturate the large chasm occupied considerable time; all the while, our patient utterly oblivious of the least twinge of pain.

The introduction of heavy tension sutures was a slow process, in the very narrow cavity of the mouth; still these—

seven in number, and twelve fine interrupted sutures through the edges, caused no pain whatever. This time success attended every stage of the operation. The remainder of her history is very simple and short. She was placed on full doses of mercury, and the parts kept clean.

Union, through not wholly primary, was complete in the end, and she left the hospital with the palate once more whole, three weeks after the last operation.

A litte more than a year ago, a middle-aged man was sent to me for the excision of a tumor which started in the floor of the month, a little to the left of the frænum linguæ.

It was explained to him, that as it occupied a very vascular region, and the mouth must be widely opened in operative manipulation, it was important to dispense with ether, and rather depend on cocaine. He was very timid, and said, that he was informed by the doctor, that he would be put "asleep" and would feel nothing. However, after a little persuasion, he yielded.

In this cases, but 35 drops of cocaine solution were employed. The removal of the growth and the closing of the tissues, in which it was imbeded, were so quickly accomplished and with so little pain, that our patient would not be convinced that the "lump" was out, until he was shown it.

In this, as in other cocaine operations on the mouth, the patient is always placed in the sitting position, before a good light. The head should be steadied by a nurse or attendant, though the patient will adjust it himself, from time to time, in such a manner as the operator indicates. This species of analgæsia will not succeed, in dental surgery. As the fangs of a decayed crown are always imbedded in parts, the seat of

inflammation, and the peridental sheath is exquisitely sensative; that the deep puncture of a hypodermic-needle is attended with great pain; besides, it is quite impossible, to reach the dental-nerve, direct, as it pierces the apex of the root.

Caution must be observed, in employing cocaine on the nose or mouth, because of their close contiguity to the brain; and the reason of the remarkable power which the mucous membrane, lining these vaults, posseses for absorption. It is seldom, that anything more is required, than to moderately swab the surface, as the needle need not be employed, unless, we propose to attack the osseus, or submucous tissues of the lips. My experience with the employment of the drug on the Schneiderian membrane is limited to few cases, except those of epistaxis.

In those, where we are about to plug the passages, for a dangerous nasal hæmorrhage, if we will first analgise the pharynx and lower nasal fossæ, by a few sweeps of a small sponge, charged with the solution of four per cent. strength, it will render our manipulations in closing the posterior naris entirely painless and devoid of spasm.

Early last winter, a boy came under my care who had a small exostosis in the left nostril, which so closed the passage that no air could pass through, and he breathed nearly wholly through the opened mouth. The mass was low down, so that contact with the surface was easy and instruments could be manipulated without difficulty. The nasal passage was stuffed, for a moment or two, with a moistened sponge, of cocaine solution, when with a strong rougeur the defected bone was quickly and painlessly torn away.

The rapidity and simplicity of this operation were in stricking contrast with two other rhinoplastic operations, with which I had been previously connected; in one as an operator, and in the other, as an assistant.

In the latter case I invited in, a specialist, to operate. The patient was placed under full, ether narcosis. Then he was operated on, lying on the back. He had a deflection of the nasal-septum which blocked one of the nares. The operator began, by making an incision arround the border of the bulging bone, when a bone elevator was employed to separate the mucous-membrane from the septum. This was a terribly bloody procedure.

The patient coughed, vomited and struggled, so that the chiseling of the bone was attended with great difficulty, and when the projecting piece was detached, it was carried by suction, into the pharynx and swallowed. It was fortunate that it did not enter the air passages, or we would have probably lost our patient. Ether anæesthesia was employed.

In February, 1893, Dr. W. G. Gaudineer, of this city, requested me to operate for him on a case of nasal exostosis of the septum, in a young man of nineteen.

I strongly urged the claims of cocaine for anæsthesia here; but in vain, for neither he nor his parents would listen to me; but, I warned them, that this would be a very bloody and difficult operation. This young man was the worst case I ever saw, for ether anæsthesia. In fact, it was quite impossible to anæsthetize him, at all. When the ether was pressed, he would be seized with tetanic spasms; he would become deeply cyanosed and cease to breathe. He took nearly a pound of

ether, but it seemed, that nothing would control the violent, convulsive struggling, and incessant fits of sneezing.

With four powerful assistants holding him down, I was able, to go hurriedly through the operation, but, not until he had bespattered everything with blood; far and near him.

This case was an ideal one, for cocaine, but I was overruled. I would never again, consent to do this operation with anything other than cocaine, as an anæsthetic; unless the patient after being acquainted with the dangers attending pulmonary-anæsthesia, preferred to face them.

CHAPTER XIII.

LOCAL ANALGÆSICS IN THE CERVICAL REGION.

Local anæsthetics serve many useful purposes in the tissues of the neck. The surgical treatment of carbuncles, situated anywhere, over the planes of the spine, is always very painful, by ordinary measures.

When permitted to run an unrestrained course; or, are dealt with by means formerly in vogue, in surgery, they are anything but inocuous lesions.

The former, routine treatment of them, consisted, in fully anæsthetizing the patient, and then making deep, crucial incisions into them.

As they are always, exquisitely sensative, full ether coma is necessary, in order to fully destroy the pain-sense, to the cutting edge of the scalpel, so it divides their thickened, indurated base. Sometimes, the incision is attended or followed by a large hæmorrhage; just at the time when the patient can least afford the loss of blood. Besides, large, open gashes are left, which augment the danger of infection, in spite of any antiseptic precautions that may be observed.

Now, the greater part of these cases, after suppuration has commenced, may be treated by injections of carbolic acid reduced by heat, to a fluid consistance.

This may be accomplished by the direct injection into the core or base, in four or five places, of from five to ten drops of this solution. These injections are attended with a sense of heat at each puncture; but it is slight and soon passes off.

The effects on the mass are immediate, and most gratifying. The extreme agonizing pain is promptly assuaged by the anæsthetic action of the phenate, formed by the combination of the acid with the albuminous elements of the pus. The anti-germicidal action of the acid is remarkable, when employed in this manner. As the fluid is injected we will observe that the surface of the of the abscess, loses its florid hue, and assumes the color of a part that has been recently frostbitten. These injections possess the dual power of arresting pain and inflammatory action.

As the acid in this pungent saturated form, immediately chars everything it comes in contact with, there is no danger of systemic poisoning following.

The injections completed, simple, sterilized, absorbent dressings are applied; which, are permitted to remain on, until the dry mummified slough is allowed to separate, and proliferation of healthy granulations has well advanced, from the bottom.

This procedure is safe, simple, painless and radical; but, to fully realize its value, one must try it on those cases, in which, other painful measures have failed.

Dr. J. Goilav, Surgeon at Bucharest, Roumania, has treated twelve cases of anthrax, complicated by glycosuria, by a somewhat similar plan, ("Traitement de l'Anthrax, *Journal de Medicine de Bordeaux*, 2 re Oct. '93).

He first injects cocaine solution into the carbuncle, and

then makes a deep crucial incision. Now, he fills the opening with crystalized boracic acid. Then, a gauze dressing is applied, under a bandage, and allowed to remain on, twenty-four hours. The pain quickly disappears, the temperature falls, and the patient sleeps.

On the third or fourth day, the dressings are again changed, when the sphacelated residue is sufficiently detached to permit of its easy removal. It was seldom found necessary to change the dressings oftener than three times, and as a rule the part was closed in, after seven or eight days. He adds, that the acid gives rise to no painful irritation; nor, is it absorbed in toxic quantities; and, he believes that this plan, is much superior to all others.

It is interesting to note, what is being done the world over, by the aid of cocaine; but in carbuncle, it is evident that a drug like carbolic acid, which is a powerful analgæsic and caustic, when cases are suitable for it, it is to be preferred to boracic acid; particularly, as the latter always entails the use of the scalpel, and displaces the alkaloid.

CHAPTER XIV.

THE SURGERY OF THE ANTERIOR AND LATERAL ASPECTS OF THE NECK.

The contents of all the triangles of the neck from the clavicle to the ramus of the lower jaw, lie comparatively superficial. The reason that these exposed region are so comparatively immune against injury, is, because of the manner in which they may be instantaneously protected, by suddenly raising the shoulders, fixing the neck, or depressing the head.

I can see no reason why we cannot ligate all the arteries in all the triangles, painlessly, with the aid of hypodermication.

After we divide the platysma and push the various sets of muscles aside, we come at once, on to nearly every artery in the anterior region of the neck; the second and third segments of the subclavian as well as those vessels of minor size and importance. However, in nervous, irritable excitable individuals, it would be better to rely, on a pulmonary anæsthetic; except, in emergency cases. As these parts are highly vascular and constitute the connecting bond for the blood supply between the heart and brain, a skilled and very cautious dissection is demanded in all cases.

If our patient is restless and insubordinate, every move will be attended with peril.

Should the vessels pursue an abnormal course and be cut across with the scalpel, our patient might be suddenly seized with terror and become unmanageable, just at the time when the loss of one minute might cost a life.

Therefore, unless the circumstances are of an unusual character, no skilled assistants are to be had, and the case will not admit of delay, we should not interfere without first placing our patient under full ether anæsthesia.

With neoplastic formations of small size, superficially located and freely movable we may fare better with cocaine-analgæsia.

By this procedure, in many of those adenoid growths of a tubercular character, when involving only the superficial chain of lymphatics, we may succeed in removing them with great ease and rapidity. The same may be said, of small cystic growths on the periphery of the thyroid gland. In cases of parenchymatous hypertrophy of one or both lobes of the thyroid gland which dangerously compress the trachea it will not succeed, so well.

CHAPTER XV.

COCAINE-ANALGÆSIA IN ADULT TRACHEOTOMY.

In the average text-book on surgery the operative technique of tracheotomy is considered in such a matter of fact, manner, that the inexperienced, average reader is led to believe, that it is an operation simple and easy of performance; but, when one, however, proceeds to perform it, without proper preparation and a full knowledge of the dangers which often beset him, by the older methods, he will be woefully mistaken, as to its simplicity or safety.

The older Gross taught, that it was one of the most difficult operations in surgery.

When we recollect the great depth at which the rings of the trachea are placed in certain individuals, that the upper part of the trachea is snugly embraced by the thyroid gland; that it is crossed and re-crossed by a large plexus of veins, that it is always in motion, and, in stridulous breathing it is pulled deeply down into the thorax, with each inspiration, we may the better appreciate some of the difficulties, attending the opening of it.

The opening of the healthy trachea is a comparatively simple procedure; but, when any part of the air passages is

the seat of stenosis and the patient has to struggle for breath, it is quite another matter.

In the latter condition, the administration of pulmonary anæsthetic, in many cases, so embarrasses respiration, as to threaten mortal suffocation.

A few of the most formidable difficulties may be better understood by the citation of a case or two, and then contrasting the difference of operating by the older and the more modern,—the easier and the safer methods.

About ten years ago, I was hastily summoned in the night to see a man, who the messenger said, was suffocating. Picking up my pocket case, I hurried to the house of the dying man. There I found, that the patient had got up during the night to take a drink of oatmeal water, when, through mistake, he took a pitcher which contained water and slaked lime. He agitated the pitcher, then raised it to his mouth, and took two or three swallows, before he discovered his mistake. He was immediately seized with an intense burning in the larynx, and great difficulty in breathing.

When I saw him he lay on the floor in deep cyanosis; the pulse at the wrist was uncountable, and he was making the most desperate efforts to get his breath. I at once saw that he had acute œdema of glottis, and that the windpipe must be opened on the spot, without any preliminaries, or all was lost.

With an old woman holding a candle, I fully extended his head, felt for the trachea and plunged the blade of the scalpel into it, with the cutting edge upward, carrying it through the cricoid cartilage. Now blood came in a deluge through the nose mouth and wound simultanoously. Everything was

spattered about him, by the first few violent coughs and spasms, which followed the incision.

For a moment the loss of blood was terrible.

As there was practically no light to enable me to see the bleeding points, I felt for the cut edges of the wound and compressed each side, between the nails of the index finger and thumb of each hand. The pressure maintained for a few moments, stopped the bleeding and gave me time to insert a few deep sutures on each side and retract the edges until a tube could be secured. Within twenty-four hours the œdema-glottidis had passed away, and in a short time be made a good recovery.

A case was brought into my service, in the Harlem Hospital, four years ago, of a man who was injured in the neck, by a loaded express wagon passing over it. He had sustained injuries of the spine and larynx. At first it was thought that difficulty in phonation and breathing were attributable to injury of the recurrent laryngeal nerves; but, as swelling soon followed, with chills and rise of temperature, it was evident that the peri-laryngeal tissues and vocal cords had sustained damage, and might at any moment threaten life, by obstructing the air-passages.

It was advised that a tracheotomy should be performed, when he was seen by me a second time; but, he preferred to take chances and wait. In the meantime the house surgeon was directed to be on the alert, and immediately open the trachea, should imminent symptoms of laryngeal stenosis set in.

On the evening of the third day, symptoms of suffocation suddenly developed; but, the house surgeon, now fully realiz-

ing many of the difficulties in the way, failed to perform the tracheotomy and sent for me.

At this time our patients condition was desperate. The picture he presented, in his agony, for breath was something dreadful to behold. His voice was now entirely gone, and he would only whisper in gasps; all the while, the shoulder rising high with each respiration. All the auxillary muscles were called into play, and the whole body was agitated.

My first efforts in the way of relief, were directed towards canalizing the larynx, through the mouth, with an O'Dwyer tube. But, I now learned the practical lesson, that intubation in the young child and the adult, is not quite the same thing. In fact, a tube of a size corresponding to age and difference, in proportions of the body, cannot be inserted at all, in certain adult. As age advances in the growing youth, the base of the pharynx sinks deeper and deeper.

In the young child, we may readily feel the edge of the epiglottis, which is the most important guide to the intubator.

But, in the adult the rima-glottidis is on a level with the superior surface of the sixth cervical; while in early life, it lies on a plane with the inferior surface of the body of the fourth cervical vertebra. Hence, in the adult, this valuable guide is wanting; and the necessary circular sweep cannot be easily made, in the hollow of the pharynx. Therefore, it is only, by a specially constructed apparatus, manipulated by an expert, that intubation is possible at all, in the adult, under ordinary circumstances. Indeed, I have been informed of a case, in which one of the most emminent living intubators, only after many protracted efforts, finally lodged the tube. But *post mortem*

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examination showed, that it had been merely fixed in the œsophagus, behind the cricoid cartilage.

I have made many and repeated experiments on the cadaver, to determine the practicability of adult intubation; devising for this, instruments, of various forms. All of which convinced me that adult intubation, as a current operation is quite impracticable, and with the expert, is always attended with difficulties. With our patient, as might have been expected, all our efforts at intubation were futile, and we hastily prepared for tracheotomy.

Now, with four assistants, excellent light, and a complete arsenal of surgical instruments, and two trained nurses to prepare sponges, and attend to other details, I was impressed with a sense of confidence, that the way was clear to tracheotomize, without any immediate danger to life.

But our troubles commenced with the preliminaries of the operation; for, with the first whiffs of ether, violent spasms of the glottis set in, and for a moment the pulse at the wrist was lost. The windows were thrown widely open, and by resorting to artificial respiration, he commenced to breathe again.

It was now thought that by the substitution of chloroform there would be less laryngeal irritation; which, was the case, but in a moment he went into syncope, and breathing stopped altogether.

By forcible artificial respiration, in a moment or two the lungs commenced to act, and he was rapidly regaining consciousness. At this juncture, while forcibly held on the table, with the head well flexed over, on the cervical spine, backward, the tissues over the trachea, which was deeply lodged, were

divided. As the thyroid isthmus was bisected, the blood issued up through the wound, in one, large, continuous torrent. Because, of the site of its source, pressure was impracticable, and as it seemed to come from every direction, the secure clamping of all the bleeding orifices was a very tedious process; hence, as soon as the nude rings of the trachea came into sight, the point of the scalpel was introduced, and it was freely opened. Some of the blood now passed into the trachea; when, he was seized with a violent spasm of all the muscles; which lasted for a moment, and the respiration ceased. The eyes rolled in their sockets, the cyanosis deepened, a frothy fluid issuid, through the mouth and nose, when it seemed, sure enough, that he was dead. But a large tracheal tube was quickly inserted, artificial respiration was promptly instituted, and after working on him for five minutes, he gave a gasp; which was succeeded shortly after by another, and in a short time complete resuscitation was established. His ultimate recovery was rapid, and he has since remained well, except, for the stenosis following the operation of tracheotomy.

Five years ago the late Dr. W. W. Dawson, of Cincinnati, presented a brochure at the Annual Meeting of the American Medical Association, in Newport, R. I., entitled "*Tracheotomy By a Bloodless Method.*"

This eminent Western Surgeon, in eloquent and forcible terms, set forth the manifold difficulties which commonly beset the operator, in the performance of tracheotomies. He maintained, that the most formidable obstacle to overcome, was hemorrhage; that the loss of blood jeopardized in two ways; first, by exsanguination, when the loss was great; and secondly, by the escape of blood into the trachea.

Therefore, if hæmorrhage could be sufficiently subdued, before the trachea was opened, the operation was stripped of one of its greatest dangers.

This contribution was soon followed by Réclus' exhaustive essay on the "Surgical Therapy of Cocaine Analgæsia." (*Gazette Hebdomidaire, 12 Mai, 1889*).

It occurred to me, that if we could combine the bloodless with the painless method, our surgical procedure for tracheotomy, would have nearly approached the ideal.

Pulmonary anæsthetics could be cast aside, our patient might be operated on, in that position, which would give us the greatest facility for manipulation.

But, so many things in our profession, when presented to us by the master hand of the word-painter, are supported by such apparent, sound reasoning and logic, that theoretically, we at once accept them; though, when we put them into practice, their fallacious foundation, at once, becomes apparent, and we contemptuously cast them aside; perhaps as worse, than useless.

In the winter of 1889, a middle-aged woman was sent in, to my hospital service for tracheotomy. She was suffering from agonizing spells of dyspnœa, from laryngeal spasm, caused by progressive, tubercular ulceration of the vocal-cords.

She was greatly emaciated and in broken spirit, because her malady was making steady headway, and now, her constant fear of suffocation kept her continually awake. Her voice was lost, and even a whisper was only uttered with great labor. This seemed to me an ideal case to try what I have designated the "Réclus-Dawson method," or the *Dry and Painless* procedure.

Our patient was well stimulated with the alcoholics, the parts prepared, and cocainization begun.

Sixty-five drops were injected through four *hubs*.

Now, with a half dozen clamps, scissors and a dull scalpel in readiness, the incision over the larynx was commenced. After the integument and superficial fascia were divided, the remainder of the dissection, down to the trachea, was made rather by tearing through the parts, than cutting. In this manner of dividing the vessels, but little blood was lost, and in a few moments, fully an inch of the bare tracheal wall came into view.

When all oozing had ceased and we had a clean, dry incision, the trachea was opened freely, and a tube slipped through the opening. The operation had been successful in every particular. There was no pain of any kind borne. We had an anæmic field, no struggling, strangling, nor vomiting. The relief to our patient was great.

After dressings were applied, and she was placed in bed, she had twelve continuous hours of sleep. She remained with us a month, making rapid improvement in her general condition, gaining flesh, strength and courage. Since she left, we have had no further tidings of her.

December, 1892, a lady called on me to see her baby, four months old. The little one for two weeks previously had been ill, suffering from a croupous state of breathing. The child was unable to nurse, and had great difficulty in swallowing. Her family physician recommended intubation, but as her sister had had two children intubated, that died with the tubes in, she demurred. The clinical history of the case and the child's condition assured me, that she was not suffering

from any ordinary disease of infancy, of an inflammatory character; but rather from some description of a new-growth, or an abscess.

I mentioned cocainization to the mother, as a painkiller in operating; for I had recommended an immediate tracheotomy; but, she feared that the little one might suffer, and would prefer, that ether would be first tried.

In the afternoon of the same day, an operation was undertaken with ether; but, alarming cyanosis set in at once, with the first inspiration, and it was laid aside. The baby quickly recovered consciousness.

Now, six drops of a one per cent solution of cocaine were injected, and Dawson's bloodless tracheotomy performed.

When the trachea was opened, a probe was pressed upward, through the larynx, when an abscess was bursted, which drained out through the tracheal incision. No tracheal tube was employed. But, the edges of the divided tube were widely separated, by strong, silk sutures, which went around the neck, in opposite directions, and were tied behind. This expedient answered admirably. Indeed, I am quite certain in a large number it is much safer and more satisfactory than any sort of a tube.

In any case, it is difficult to secure a tube, which properly fits; that is not too large or too small; in which event, it is worse than useless. The after-treatment on this case was simple; recovery was prompt; and, in ten days the tracheal incision had closed.

Cocainization should totally supplant every description of pulmonary anæsthetics; both in acute and chronic stenosis of the larynx, in the adult, and in infancy or childhood, when

volatile agents greatly augment the dangers of operation.

Combined with efficient hæmostasis, it renders safe and comparatively simple, an operation heretofore regarded as one of the most difficult and dangerous in surgery.

CHAPTER XVI.

LOCAL ANALGÆSICS IN THE SURGERY OF THE UPPER EXTREMITIES.

The number of pathological conditions in the extremeties, which may be safely, painlessly and promptly operated on by cocainization, is very large and ever growing.

In certain respects, these pendant members of the body, present advantages, foreign to other parts; though, withall, are not quite satisfactory. In the first place, by utilizing Dr. Leonard Corning's method of applying a firm elastic band, anywhere above the point at which, we are about to insert the needle, we retard the entrance of the alkaloid into the general circulation, and can prolong its local action. However, this advantage is not as great as it seems, and, after all may be one of questionable value, in any other, than rare and exceptional cases.

As cocaine-analgæesia properly effected will continue thirty minutes, it may be a question whether or not, the tissues can safely bear constriction and total arrest, of the circulation, over a longer period. There are few operations suitable for cocainization, which cannot be completed within the limit of half an hour.

In any event, when we are about to perform an operation which will entail a considerabld loss of blood, we will apply

the rubber-bandage, and keep it on, until hæmostosis is complete. But, the muscular substance and the impenetrable osseus tissue are quite immune to cocainization; hence, the reason why we cannot utilize it always with advantage, through any part of the upper or lower extremeties, in amputations, except those of the digits.

Since this monograph has commenced to run through the press, I have been favored with a highly valued communication, on the use of cocaine in the major amputations, from Dr. R. H. Cowan, of Radford, Va.: He says * * *

"Within the last twelve months, I have ventured farther, and performed several more serious operations with cocaine as my anæsthetic, and in every instance, its action has been all I could desire. Anæsthesia has been perfect, no bad symptoms have occurred, and union by first intention has been the rule.

"The operations have been as follows: A large and deeply imbedded tumor (adipose), removed from the popliteal region, and seven amputations—four of the leg, and one each, of the thigh, forearm and arm.

"Cocaine was, I believe, first advised in amputations by Dr. Corning, and his advice was strengthened by an actual experience. Why, he has not had more followers, I do not know; it is, however, for this very reason, that I am induced to contribute my early experience. I am well aware, that we have reports of disastrous results from cocaine, nor would I countenance the reckless administration of a drug, with whose properties we are, as yet, but little acquainted. Whether or not cocaine will supersede ether and chloroform, in the near

future, I cannot say; but, believing, that it is only by reports, from actual experience, that we can arrive at any definite knowledge of its virtues, I desire to contribute my mite.

"Before concluding, I may mention some of the advantages, which, it seems to me, are secured by the use of cocaine:

"1. Absence of depressing effects, in cases of severe shock, or of constitutonal weakness.

"2. Freedom from nausea, and vomiting after operations.

"3. Limitation of anæsthesia (of course construction with an Esmarch above point of operation is made) to the field of operation, and consequent comparative security from fatal narcosis.

"In the above mentioned operations (with the exception of the first two amputations) I have, at the suggestion of Dr. Wythe, employed a 2% solution. This strength, while proving equally or perhaps more efficient, in producing anæsthesia, possesses the additional sdvantage, of reducing to a minimum, the danger of any toxic effect."

In answer to enquiry, as to particulars, the doctor has very kindly informed me, that he has used from half an ounce to two ounces in major amputations, as of the upper third of the leg and the thigh. He at first used a four per cent. solution, and later a two per cent. After his injections are finished, he kneads the integuments well, and waits from five to ten minutes before making the severance, through the continuity of the limb. He always employed the Corning elastic band. All the doctor's cases were males. He gave a moderate dose of whiskey before commencing operation. He has observed no bad results, from the use of cocaine, either locally, or otherwise, for all his patientr made good recoveries. He has

performed two more leg amputations, since his first note came to me, now making four amputations of the leg, one of the thigh and one af the forearm, all recovering.

Since Dr. Cowan commenced cocainization as a general analgæsic for amputations, Dr. Charles E. Peyton, of Roanoke, Va., has performed, with the happiest results, an amputation of the leg, with this agent.

Dr. R. H. Cowan, says, he should be given the full credit of introdncing, on a large scale, the use of cocaine, as an analgæsic, in major amputations, in America, as a general practice, and, in all cases, saving his patients.

Cocainization usually serves an admirable purpose in finger or toe amputation, in whitlows; in surgical necrosis of the finger-bones; in tenotomy, or dissection for Dupuythren's contracture, and other conditions, demanding the division of the tissues of the body. As the hand, and the foot, too, on its open surfaces, over both the fingers and toes, are covered by a dense, tough felting of integument, the penetration of the hypodermic needle is painful and difficult. In fact, this constitutes the greatest objection to hypodermication here; for, sometimes these punctures are as painful as incisions in these vicinities.

In the neighborhood of the radio-carpal articulation, thecal cysts, or bursæ are frequently seen; and especially on the dorsal aspect of the wrist. Very often, their situation and their origin, as suspected from their physical characters, are very deceptive. They usually seem to lie immediately under the skin, are quite mobile and give the impression of having no very deep attachments.

Many an unwary practitioner has come to trouble, by an attempt to remove these, by incision. Several years ago, I assisted in the attempt to remove one of these innocent-looking bodies. On dissection, the thin cyst-wall ruptured, and it was found, that its base was continuous with the tendon of the supinator-longus muscle.

The most violent inflammatory reaction, with deep-seated inter-muscular inflammation followed; which required many deep incisions to evacuate the pus-formation. The general suffering was great and long continued. Finally, when suppuration ceased, considerable and painful anchylosis of wrist-joint and fingers remained. This made me cautious of ever attempting anything more for these cases, than by palliative measures.

Lister's doctrine of antiseptics was an attractive one, when we were assured, that with the riged application of antiseptic agents, inflammation after operations might be often prevented. My early experience lead me to support that view, though it was not long, before I was thoroughly convinced that it was not faultless; and that on the contrary, when chemical solutions are employed on any of the serous membranes, or the bones, they are often followed by a most pernicious type of inflammation.

A young school teacher was sent to me, by Dr. Geo. D. McGauran, suffering from a very painful bursa, which was situated near the styloid-process of the radius on the right wrist. Her hand was so crippled by it, that she was unable to hold a pen in writing; besides, it had become very painful.

Bandage pressure, painting with tr. of iodine, and liniments had been used, without benefit. Finally, the doctor

advised, that she have it cut out. At this time antiseptic-treatment of wounds was in full blast, and we had come to regard no region of the body, as outside the domain of surgery.

This young lady was advised, however, of the possible danger of post-operative inflammation. She avowed herself ready to take the chances; saying, that she could be scarcely worse off, than she was then, with a crippled hand.

Under the strictest antiseptic precautions, this bursa was exposed and raised unbroken, into the incision. It was then opened slightly at its apex, and a small probe introduced, which passed at once into the thecal sheath of the tendon of the extensor-proprius-pollicis. Now, a fine cat-gut ligature was thrown around its base and tightly secured, when the body of the cyst was cut away, with scissors.

The usual dressings were applied, and the whole hand and fore-arm fixed in splints, and suspended in a sling. But with all our care, sharp inflammatory reaction followed. Ice-cloths were continuously applied over the wrist for four days, and opium had to be freely employed to relieve pain. She barely escaped suppuration at the seat of operation, and was unable to return to school for more than three months.

It is well known, that other measures are recommended, for the treatment of these tumors, in the average surgical text-book; as, injection with irritating fluid, pressure, etc.

But, their free injection may be followed by a very troublesome inflammation.

Moderate pressure is not effectual; though, if we deal with them by the severe application of concussive force, a cure as a rule, will aften promptly follow. Sometimes, however, in consequence of the low grade of inflammation, which often super-

venes, after they appear, their walls so thicken, that the concussive force necessary to rupture them, must be directed in a certain manner, and with considerable energy.

Therefore, unless over patient is under ether we will probably fail; because of the the pain induced; and that occasioned by the manipulation of a joint, already the seat of morbid sensativeness.

For considerable time past, all of these cases coming into my hands have been radically dealt with, by the aid of cocaine injections. The technique of operative intervention may be divided into three stages.

FIRST.—Thorough asepsis of the parts and needle.

SECOND.—Hypodermication with puncture of the cyst.

THIRD.—Sudden and considerable concussion.

In all cases, the area about to be treated should be completely cleansed and disinfected; after which those exposed parts above and below, should be enveloped in sterilized towels or gauze. Now, we commence hypodermication, after we have prepared our solution and needle.

The first step is, to plunge the needle-point directly into the base of the tumor, and to deposit from two to five drops of the solution. The remainder of the charge is sprayed along the needletrack. Then another charge of the solution is sent in, at another angle, but this time the cyst is not penetrated. From thirty to forty-five drops, have always been ample, in my experience.

Cocainization complete, the fore-arm should be firmly seized, and using the hand as a lever, we should first, by gradual, but firm and steady motion, to forcibly flex it on the wrist. Now, we reverse this motion, and hyperextend it, on

the dorsum of the fore-arm; when, again full adduction and abduction are made. The needle-puncture made in the first injection, serves two important purposes.

First, It deadens sensation in the interior of the cyst over its peripheral surface; and,

Second, On pressure, it allows the contents to escape, into an atmosphere of vascular connective tissues. In different cases, by the wrist movement here described, alone, I have been able to crush those cysts, without doing anything further; but, should this manipulation fail, as it often will, in chronic cases, yet it frees all deep-seated attachments, and liberates adhesions with adjacent tendons, so that the complete demolition of the cyst, which has resisted moderate pressure will be all the more complete and radical. After hypodermication and vigorous joint manipulation, we are prepared for the third stage; provided, the bursa still remains.

Our last and final act, now will be, to rupture or crush in the cyst-wall, by one or more severe blows, directed immediately over the tumor. With a view of executing this step of the operation with precision, the mobile mass must be pushed over and fixed on an osseus surface.

I have usually found the head of the radius, to admirably fulfill the purposes of an anvil, in these cases. Most any metallic substance, weighing from six ounces to a pound will answer for a mallet. A small gauze bandage is passed around over the wrist and bursa. Its rough surface prevents the tumor from rolling or gliding under the skin, when struck. Now, we are ready for percussion. We should take accurate aim and strike with considerable force; of course in each case, according to the special circumstances.

When we strike directly over the bursa; which we steady with the fingers of our hand, it is totally destroyed, but, if we miss our aim, or apply insufficient force, then we may give pain, and besides, must repeat the blows.

The whole thing, occupies much less time, than it requires to describe it. The procedure is rapid, radical and simple. I have never seen or heard of any unfortunate sequelæ following the procedure, when judiciously employed.

The after treatment is practically *nil.* The patient is advised to wear a bandage, and to exercise the limb as soon as he desires.

Observations.

Dr. James Moran, of New York, brought a locomotive engineer to me during last October (1893), who had a large bursa on the dorsum of the right wrist, immediately over the radio-carpal articulation. It had given so much pain latterly, as to render the hand quite powerless.

He had come in to make arrangements for an operation. He urged me to so treat the case, that he might be laid off, but a short time, as it was a busy season of the year, on the line which employed him.

Then and there in a few moments, by the procedure heretofore detailed, his bursa was destroyed with a rapidity, completeness and painlessness, that amazed him and the doctor. He went on his engine as usual the next day, with no more stiffness in the joint, or neuralgic pain in the arm or fingers.

Dr. Wm. G. Gaudineer, of New York, in the same month invited me to his office, to see another case of a similar character, in a young woman. She had suffered for a long time

from the bursa, and in vain, tried every ordinary remedy. Now, that it was becoming rather worse than better, and the hand was quite powerless, she applied for surgical relief.

This bursa had a very thick capsule and required several severe blows before it yielded. She went on about her work the next day, and the result has been entirely satisfactory. One advantage about this plan of treatment is, that it permits of our patient continuing at his usual occupation; which, to working men or women is a great gain.

Perhaps, in the cold, frosty weather of winter, it would be prudent to require, that the parts be kept well covered, and in a state of rest, for two or three days, before the hand is used.

CHAPTER XVII.

LOCAL ANALGÆSICS IN THE SURGERY OF THE THORAX.

The anterior and lateral walls of the thoracic cage, in the female, are very often the seats of such pathological conditions as require the intervention of surgery for their relief or cure. For intra-thoracic conditions, exclusive of those which are dependent on diseases of the pleura, mechanical-therapeutics can not accomplish much.

The anterior and latteral walls of the thorax are more intolerant to incised or punctured wounds, than any other part of the body.

Many times, we will observe the most alarming collapse and shock, following penetrating, surface wounds over the thorax. In fact the constitutional symptoms have been, altogether out of proportion with the local conditions.

The mammary and the axillary regions are those, most tolerant to the mechanical division of the tissues.

Even now, though hand to hand encounters in battle, are unusual, yet, many nations of Europe have their Cuirrassier's; (those troops who wear heavy leather shields over their chests) for, it is well known that the thorax is the most vulnerable, to sharp edged weapons.

It cannot be said that cocainization is a satisfactory agent for surgical operations, on the thoracic appendages.

My experience with its employment over these areas of the body, have not encouraged me to continue them, unless there are circumstances and special conditions, which should exclude pulmonary anæsthetics; and even then, I would not employ them, unless, the patient was first carried to the point of inebriation, before cocainization was undertaken. It may be however, that with time, we may devise such a technique as will so completely fulfil the requirements of a local analgæsic that we can quite generally discard the volatile anæsthetics here. At the present time, we can not very well recommend a local-analgæsic, for opening an abscess of the breast; because with a keen lance, and a dextrous hand, one can reach a pus-cavity with as little pain, as to insert a hypodermic-needle. The breast is richly provided by a nerve supply from various sources, which endows it with exquisite and special sensativeness.

It is a very vascular organ, which may give us serious trouble in operations on it, if one is not skilled and well prepared to deal with profuse hæmorrhage. Large and repeated hypodermic-injections must be made to annul a large zone of tissue, which the scalpel must deeply cleave, in all neoplastic formations which occupy the mammary-gland.

We may succeed in benumbing the cutaneous filaments, but as the deeper perimammary and submammary tissues are reached, the suffering is considerable. This is precisely the juncture, at which our dissection must be somewhat tedious and critical, and, when too, a quiescent state is imperative.

In those breast amputations which entail a long incision

into, and opening up, of the axilla, cocaine is quite out of the question.

Within the past six months three cases have come under my care for operation, which illustrate, in a certain degree, the unsatisfactory character of cocainization in the surgery of the mamma and thorax.

CASE ONE.—Patient, 30 years old, single, female, in general good health. She was suffering from an epithelioma of the right mammary gland. The tumor was about the volume of a medium-sized orange, and was lodged towards the lower and inner border of the gland. The nipple was slightly retracted, through the mass was freely movable. As it had become the source of constant pain, she was anxious to have it removed, but, she protested against taking ether, because. about one year before, her sister had been operated on for a similar tumor of the breast, and died under ether-anæsthesia, she said, on the table. We therefore decided to test the value of cocainization in this case.

The parts were prepared in the usual manner, and one hundred drops of a one *per cent* solution of the alkaloid were inserted, some immediately beneath the integument, some into the margins of the growth, and others deeply under it.

She was a woman of great determination and fortitude; and, though there was apparently no pain caused by the division of the integument; but, as the edge of the scalpel passed through the connective tissue, and the tumor was rolled out from its deep attachment, with the capsule of the gland and the pectoral muscle, the suffering was very great.

She became deathly pale; the pulse was quick and thready, and she breathed irregular, deep gasps.

By the time the vessels were all secured, and the divided surfaces were closed in, she recovered herself. She reacted promptly and made a rapid recovery

Indeed, the operation and the result were all that could be desired, except, that it seemed cruel to inflict severe pain, when it was possible to wholly prevent it. Nevertheless, she was perfectly satisfied, and said, if she would ever require a similar operation, she would prefer to go through the same course, than risk the dangers of ether or chloroform.

CASE TWO.—Early in September (1893), an elderly female, was sent to me suffering from a large, chronic, painless tumor on the right aspect of the chest.

It was rather inside and above the nipple, and seemed to have developed from the periphery of the gland, rather than near the nipple. She came to have the mass removed, rather because of its deforming effects, and because it lately had rapidly increased in size, than, that it gave her any inconvenience, for she never had any pain in it.

She was 68 years old, of a spare build, and there was no evidence of a cancerous cachexia. On examination it was clear, that she had considerable cardiac hypertrophy with valvular disease.

She expressed a strong repugnance to taking ether or chloroform, and declared she was ready to endure the pain of operation, provided she could be assured that she would survive it.

Considering her chances from my experience with the preceding case, and believing from the physical qualities and anatomical character of the mass, that its removal would be but the work of a few moments, she was informed that there

was every reasonable prospect, that she would come safely through.

As she always lived a severely, abstenious life, she bore alcoholics poorly, so that, when she was placed on the table, she was wanting in that spirit and courage which spirituous liquids give.

On the contrary, she was extremely melancholy and peevish; besides, inclined to find fault with everything.

Hypodermication was attended with great difficulty. With every insertion of the needle, she loudly screamed and tried to roll from one side to another. It was now realized, that we had a very troublesome case to operate on.

Accordingly, when it was decided that cocainization had been carried far enough, and the surface was suddenly chilled, two deep, long ovals were quickly made with the scalpel, through the skin and deep fascia, when the mass was seized, and raised from its deep attachments with ease and rapidity; in the meantime, the patient emptying her vials of wrath upon me "for practicing a deception on her." The completion of the operation was simple and occupied but a few moments. The old lady lost but little blood, and had but little shock.

The wound healed very rapidly, and two weeks after operation, she left for home. By this time she had experienced a change of heart, and, on leaving apologized for her conduct on the day of operation.

CASE THREE.—Patient, a robust vigorous man, 36 years old. About a year before, while intoxicated, he was thrown from a wagon, and fractured the seventh and eighth ribs, at a point corresponding to the vertical nipple-line. But, he continued at his usual work, without applying any description of

treatment; but, his injured side gave him more or less pain when he performed heavy labor, and for more than a month previous to entering the hospital, a fistulous opening appeared at the seat of fracture, which had discharged pus intermittantly; besides, it was very painful to the touch, or, on sudden motion of the body.

His physician, discovering evidence of shattered, necrosed bone, had recommended surgical measures.

On examination, with the probe, dead bone was readily detected, at the tip of it. On the day fixed for the operation of resection of the diseased costal structures, he stubbornly refused to take ether, and said he would bear a little pain, rather than use the "stuff."

The case, then was another, in which to give cocaine a fair trial, though, it may be premised that he imbibed with relish more than eight ounces of whiskey, before cocainization was commenced; and would have taken much more if we had offered it. The tissues over the seat of necrosis were boggy, with hard, indured margins, requiring a long and strong needle to piece them. About one hundred drops were sprayed through the muscular and connective tissue, when, after surface chilling, the incision was made.

This incision was bisected by another, so that through a large conical gap, well retracted, one was enabled to reach the costal periosteum, which was considerably thickened. He gave no expression to suffering until the periosteum was penetrated. This could not have been well cocainized.

Now he commenced swearing, and kept it up, until, all the disintegrated bone was freely exposed and gouged out of its thick periosteal bed. We observed great caution to avoid

opening the pleural cavity. The diseased tissues cleared away, the wound was solidly closed from below, with catgut suture.

The closing of the parts seemed to give him little or no pain. After the operation was complete and he was returned to bed, he expressed himself as well pleased, and declared, that if he ever had a similar operation performed on him, he would prefer cocaine to relieve the pain.

In this case it must be confessed, that the performance of the operation was much more easy than it would have been under ether. There was no strangling, choking, vomiting, or tetanic spasms, which are so common in the etherization of large-framed, vigorous young men.

The sequelæ were very simple. Union was rapid, aseptic and solid. He left the hospital on the fifth day, though he returned once, for a final dressing of the wound.

These three cases constitute the sum total, of my experience with local cocainization, in the surgery of the external appendages of the thorax. That it possesses valuable properties here, no one who has given it a fair trial, will dispute.

For innocent, moderate-sized tumors, freely mobile and outside the mammary district, or any part of the thorax, it should be preferred to pulmonary-anæsthetics; unless, there are special and urgent reasons, for employing the latter.

CHAPTER XVIII.

COCAINIZATION IN THE SURGERY OF THE ABDOMEN.

The abdomen provides us with the most fertile field in the body, for the utilization of cocaine-analgæsia. But, even this great region, has its limitations, and, is often the seat of many pathological conditions, in which, it must be discarded.

If we divide the abdomen by a horizontal-line, passing through the umbilicus, into two great districts, we will, with considerable precision, locate those sub-districts, wherein cocaine plays a marvelous rôle as a local analgæsic, and as a life-saving agent; and, those in which it cannot be relied on.

It is well known, that all abdominal sections above the umbilical line, are attended with a greater mortality than those below it; that their performance is followed by a greater difficulty; and, generally occupy more time. It practically has no place, in the surgery of the epigastric, the right or left hypochondriac, or the umbilical regions. In the lumbar regions, there are conditions in which it may be most happily employed. In the hypogastric, the right and left inguinal regions, cocainization occupies an unrivaled position.

It is important, however, to always remember, that when employing this agent as an analgæsic in the surgery of the abdomen, that we proceed on certain definite rules.

With the single exception of hernia, cocaine should not be employed in the surgical intervention, of any pathological lesion, which is free and clear of the parietal peritoneum; nor should we, in any operation, in this region, which may be attended with a tedious dissection or complicated manipulation, commence, without having a pulmonary-anæsthetic within convenient reach.

Enumerations of the Pathological Conditions in Which Cocainization May be Utilized With Advantage, From Above Downwards.

First.—For Pyo-Nephrosis, or Hydro-Nephrosis; Lumbar Cysts or Abscess; Lumbar Colotomy; Pericæcal; Encysted Abscess in Appendicitis.

Second.—Cystotomy for Vesical Evaçuation, or for Stone in the Bladder.

Third.—For Hernia in the Inguinal or Crural Regions.

In those pathological lesions, of the renal structures attended with a large, encysted, accumulations of pus, or a voluminous quantity of urine, caused by a blocking or stenosis of the ureter; and in which but one kidney preserves its functional activity, cocainization serves other, than those primary purposes previously claimed for it. Its employment here, entirely obviates the great danger which is always present, from suppression of the urine, through the action of ether on the sound kidney. The operation is entirely rectro-peritonetal. Under cocaine we may tap the abdominal wall, or we may

penetrate into the parenchyma of an organ and lay open an abscess.

If it is thought well, after having evacuated the renal contents, to go further and perform a nephrectomy, as we may have troublesome hæmorrhage to deal with, then, we should resort to a moderate etherization.

In lumbar colotomy, as our patients are commonly greatly emaciated, before the complete blocking of the rectum occurs, the descending colon may be reached with ease, through Petit's triangle, and an artificial anus made. To my mind, this situation, presents many advantages, from various considerations, over Madyl's operation, of inguinal colotomy.

At all events, lumbar colotomy, we are told by Réclus and others, is comparatively a simple and always a painless operation, under cocaine. In those cases of long-standing fæcal obstruction, there is an auto-toxæmia from resorption.

Now, to add another lethal agent to the circulation, must clearly, render our patient's prospects of recovery, from operation, much worse.

No opportunity has yet presented itself to me to test this description of anæsthesia on a case of lumbar colotomy, except one about a year ago, when circumstances prevented me from taking it in charge. A message was sent to me, to visit a woman who, it was said, was suffering from colic and constipation. When I reached the house, it was apparent that she had been freely dosed with morphine, for, she had pin-hole pupils and was well narcotized. She was so stupid that I could secure very little of her history from herself. On examining the abdomen, I found the colon enormously distended, the abdominal walls being greatly wasted.

Passing, my index finger of the right hand, into the anus, it was discovered, that the rectum was solidly plugged, by a solid impenetrable mass of cancerous tissue. As I had to leave the city, on this day, for about a week, I recommended that she be brought to a hospital in the vicinity, for immediate operation.

This advice was not taken, and she died, unrelieved, the following day.

In cases of localized, encysted, typhillitic abscess by the aid of cocaine, we may inhibit sensation, while an appropriate incision is made and ample drainage is secured. In these cases the posterior surface of the pyogenic membrane is extra-peritoneal, and easily reached, when, the seat of active inflammation.

Such case came under my care in the practice of Dr. Pyne, of Yonkers, N. J., a little more than a year ago, The patient was a young man of 20, a student, who had been suddenly seized, with violent abdominal pain.

When an abscess had been diagnosed, I was sent for to operate. Cocaine was employed, in the usual manner; but it was found to be a complicated case, requiring a very tedious manipulation, and sensation of pain returned before the operation was completed. He, however, made a very satisfactory recovery.

In some of these cases, which have run a chronic course, the muco-purulent mass spreads far backward, into the retro-peritoneal tissues, behind the kidney; or, as in the case of a child which came under my care, last March, the pus may take a forward direction over the latero-anterior wall of the abdomen, and make its way out at the umbilicus.

With this class, if there are no special impediments in the way, ether should be employed; for, if our operative intervention here, is not radical and thorough all is lost; or we may leave our patient in a very much worse condition, than if nothing had been undertaken.

CHAPTER XIX.

COCAINIZATION IN SUPRA-PUBIC OPERATIONS ON THE BLADDER.

The bladder in the male is so far uncovered anteriorly, by the peritoneum, that it may be reached through the space of Rezius, and explored without danger of infecting this serous membrane.

But Guyon, of the Hospital Necker, of Paris, has recently demonstrated, that there are certain localized lesions of the interior of the bladder, which may be as safely and more completely treated, by a laparotomy, with an incision directly through the exposed fundus; which, is closed later hermatically, by two or more rows of sutures.

Those supra-pubic operations on the bladder, are not such innocent and simple procedure as they seem; for, at this site drainage is not satisfactory, and the danger of infection is great.

Their mortality is considerable. But, there are circumstances which justify or demand an entrance to the bladder through this route. In many of these, there is chronic vesical trouble, with associate renal disease. Here, it would be an incalculable boon, if we could obviate the disasters which so frequently result, as a sequence of nephritic de-

rangements, consequent on ether administration, for vesical operations.

No case appropriate for a test of cocainization, in suprapubic operations has presented itself to me, therefore, I am unable to speak of its value in them, from personal observation. However, as the operative area in suprapubic cases is a narrow one; is not occupied by any large blood-trunks in its centre, in such cases, as simple incision of the bladder-wall for the evacuation of urine in neoplastic obstruction, with the permanent fixation and drainage of the bladder, through the route; for the removal of large calculi, or other conditions, which precludes intervention by way of the perineum, and in all cases, in which we are in possession of unerring proof, that the kidneys are the seat of extensive changes, we should not hesitate to employ cocaine, as an analgæsic.

CHAPTER XX.

COCAINIZATION IN KELOTOMY FOR STRANGULATED HERNIA, AND IN OPERATIONS FOR THE RADICAL CURE OF THE NON-STRANGULATED VARIETIES OF HERNIA.

Cocainization has radically revolutionized the treatment of strangulated hernia; though, not to such an extent yet, as, no doubt, it will later, when its analgæsic properties are better known, and the technique for its administration is more completely understood.

Heretofore, the mortality from operations for strangulated hernia has been enormous. It is one of those surgical lesions, the treatment of which, it appears, has been in no manner improved by antiseptics.

In my student days, I was amazed at the fearful mortality which followed these operations, even when performed under the hands of master operators; and what I saw in my interneship later, in no manner diminished my impression, of the terrible seriousness of these cases. I have seen the patient die on the table before operation could be completed; others sank in mortal collapse, or never came from under the anæsthetic after they were returned to their beds.

Finally, when engaged in an active, mixed, surgical service, I must confess, that there was no class of operations which gave me so much anxiety, as those cases for hernial strangulation.

It certainly would be unfair to attach all the blame to the operation, for the large lethality; for, in a certain number, the practitioner had irretrievably damaged the bowel by an excess of, or misdirected taxis; or, by allowing too protracted delay. But, that the operation itself did not add enormously to the dangers, in incomplicated cases, it would be idle to dispute.

Taking a retrospective view into the past, and carefully analyzing all the factors which led to a fatal termination in these cases, it is my firm conviction that it was the ether or chloroform anæsthesia, which was responsible for more deaths than all other causes combined.

Practitioners, knowing the small chance their patients with strangulated hernia had, after operation, exhausted every expedient, before they finally committed him to the operator.

Therefore, it had come to such a pass that cases were often sent in, in a moribund state, or with the bowel bursted or gangrenous.

But now, things are changed, as it is more generally known that an operation should save every case; and, that the practitioner, with or without skilled assistants, may always himself overcome, at least the immediate dangers; though, perhaps, not sufficiently skilled to perform an entire herniotomy *secundem-artem*, we should rarely hear of a death, from an operation for strangulation. Few who are not practically familiar with operations for strangulation, perhaps, would regard with skepticism the mortality figures; or, believe that

heretofore, the patients' chances of recovery, were but little greater than death.

Let us see, what our British cousins have to say on this point.

Mr. Anthony A. Bolby (*London Lancet*, May 20, 1893, "Mortality after Operations for Strangulated Hernia"), states that the mortality at St. Bartholomew's Hospital for the past ten years (from 1883 to 1893) was 40 *per cent.*

He further added, "that the mortality, for operations for strangulated hernia, was much higher than was generally supposed." He quoted from Barry's figures of 1884, to show that in 940 cases, treated consecutively in Guy's, St. Thomas', and St. Bartholomew's Hospitals, the death rate was 43 *per cent.*; being about the same in each institution.

Mr. F. Treves, in discussion on Mr. Lockwood's paper, April 4, 1891, said, "that the average mortality in all the London Hospitals, for operation in strangulation cases, was about 50 *per cent.*"

Mr. Bolby summarizes as follows: for 165 operations for femoral hernia, strangulated, 59 deaths,=37.7 mortality. Inguinal hernia, 104 operations, 30 deaths; or 28.8. Umbilical hernia, 24 cases, with 14 deaths, or 50 *per cent.* A total, in his own practice, of 293 cases, with 103 deaths; or 35.8 in St. Bartholomew's Hospital, for the past ten years.

He added, "that the mortality need not be more than 5 or ten *per cent.*, as few die from the operation; the majority being fatally injured, before operation. Peritonitis causes but a small minority of deaths. When it does occur, it is usually from perforation. He had known perforation to occur nine days after operation. Most deaths are due to starvation, ex-

haustion, retching and pain." The former quotation has been made nearly completely from the original, because, it so fully and scientifically summarizes many of the most salient features, observed in strangulation cases.

He truly says, "that the operation is often unjustly blamed; and the major portion come under the surgeon's knife, only when pain, retching and exhaustion have done their deadly work."

Yet, withal, there has been a larger margin of fatal cases, dependent on the shock of operation, than Mr. Bolby is willing to acknowledge.

Certainly, we cannot scarcely attribute death to retching or pain, when there has been little; and, when our patient possesses a goodly share of vitality, before operation.

But, an operation for strangulation, should not of itself entail such grave dangers. There is practically no blood lost; no vital parts are manipulated; and in skilled hands is a simple and rapid procedure.

Wherein, then, lies the secret of this dreadful mortality, in recent uncomplicated cases?

My answer is, that it lies in the pulmonary anæsthetics. Unhappily, in any surgical operation, in which pulmonary anæsthetics are employed, our patient has to face a double danger, and in strangulated hernial-cases, this is particularly the case, as an abundant experience has many times convinced me.

Now, precisely why this should apply, rather to strangulated hernial operations than to others, I am unable to say, or to explain, except on the hypothesis of what is known, as "ether shock;" or that state of collapse, so commonly ob-

served, after an anæsthetic has been carried to full coma; when the reaction and collapse, which succeed to over stimulation are so great, as to completely overwhelm an already over-strained and weakened system.

Pain is a cardiac depressant of great potency and when intensely poignant and long continued, induces deep collapse. Now, it is well known, that all pulmonary-anæsthetics, first stimulate and consecutively depress. Hence, it may be in many cases of operation for strangulation, ending mortally, that the accumulative depression, following the primary pain and the volatile chemical, was too great for the recuperative powers of Nature to overcome.

In my own early experience in operations for strangulation, by the method then in vogue, the mortality was something appalling.

With such untoward results, after the use of the scalpel, very naturally tentative methods, taxis, posture, cold applications, etc., were strained to their utmost, before resort was had to surgical intervention.

Now, however, the whole aspect of affairs is changed, and in every case of strangulation, attended with serious symptoms, after moderate taxis has been once fairly tried and fails; then, an operation should be immediately performed, under cocainization.

Under cocaine analgæsia, in all uncomplicated cases of strangulated-hernial operations, the mortality has fallen from more than fifty *per cent.* to practically nothing. Certainly, when a man has been tampered with, until grave symptoms set in, and he is then hurried out of a warm room into a cold ambulance, and transported over the rough pavements, for one or

more miles, to a hospital, we need not expect impossibilities, from any sort of surgical therapy.

The operations for strangulated hernia may be divided into two general classes.

FIRST.—*Those that embrace the relief of the strangulation, and that alone*—incomplete operation.

SECOND.—Those in which is added to the former, the additional procedures for a radical cure—complete operation.

The hypodermication of cocaine, supplies us with an analgæsic action of sufficient potency and duration, to painessly deal with either. There is no operation in surgery, in which the great advantages of a local anæsthetic are more evident, than in this class.

At a time, after intestinal replacement, when the most absolute quiescence is necessary, we will have with cocaine, none of that retching or vomiting, so common after general anæsthetics.

We have no more post-operative shock, because a kelotomy entails, but a superficial division of the tissues, and no great blood or nerve trunks are severed, besides when decortication of the sac, or its contents is proceeded with properly, the elements of the cord entirely escape injury. Our patient takes any position which we may direct, so that on the whole this formerly formidable operation, is at once stripped of many of its former dangers and greatly simplified.

Therefore, with cocainization within reach; at the present time there is no excuse or justification, for protracted delays in strangulated hernial cases, attended with dangerous symptoms; but immediate operation must be done early, and the imprisoned bowel released. If the medical-attendant be not

an experienced operator, he should perform the incomplete operation, and allow his patient ample time, for full recuperation, before he will turn him over to the surgeon, for definite treatment.

By the incomplete operation is understood, that procedure, in which, our objective point is the immediate release of the obstruction, in the intestinal current. Therefore, its details are but few, and of a rudimentary order.

Our operative area will be of diminished proportions, and the time occupied will be very short. Remembering, that our only and cardinal purpose in view, is to relieve the intestinal stenosis, we will, according to the type of hernia before us, reduce the intestine or not. In a case, in which the intestine has suddenly and recently slipped out, through the internal or external ring, our purpose will be best achieved, by simply cutting down, freely widening the canal, and returning the bowel. We may open the sac or not, according to circumstances. In old incarcerated cases, after a free division of the constricting canal or ring, opening of the sac and complete liberation, at the point of stenosis, nothing more is done. The omentum or intestine may be left *in situ*.

It may be said here, that the *reduction* of the intestine is not an indispensible part, of every operation for strangulation. And further, let no one search for a constriction of the bowel's wall due to a contraction, in all cases, either in the neck of the sac or in the ring; for, in many there is none.

The fundamental condition in most cases, is simply a want of proportion. A knuckle of intestine is crowded through the ring, into a foreign district, which resists its intrusion. Active congestion and inflammation follow, so that, in a short

time, what was forcibly crowded out of the abdomen, has increased so in volume, that it cannot get back. Now, the canal of emergence has not diminished its diameters. The primary indications in treatment, then, are, to so widen the breach, as either to remove pressure, or to permit the intestine, to return.

This, the so-called incomplete operation secures. In fact, it is essentially the old operation, except, that in all cases, the intestine is not returned.

The complete operation includes the radical cure. In the larger number of cases, this may be superadded to the former, when our patient's condition will permit it; when, aseptic conditions may be rigidly observed, and we are fully prepared, to go through with it.

It is unnecessary to detail herewith, the great diversity of technique, which has been elaborated in the recent past; as I have endeavored elsewhere, to describe systematically, and, in detail, all the more popular operations employed for radical cure. ("Hernia, Its Radical and Tentative Treatment, in Infants, Children and Adults.")

My first case of strangulated hernia, in which cocainization was resorted to, came under my care, in the summer of 1891. Since that time, I have operated on thirteen strangulated cases, with the aid of this analgæsic, locally employed.

Case One.—Patient, a female, 24 years old, single, was admitted into the Harlem Hospital, late in the night of the 25th of June, 1891.

She had been actively treated outside, for internal obstruction of the intestine, and I was sent for at two o'clock in the morning—shortly after her admission—to perform a laparotomy.

She was now in most profound collapse, having incessant fæcal vomiting, great thirst, and the well-known, anxious visage of one, sinking from intestinal obstruction.

Her extremities were cold, and the pulse barely perceptible. I first inquired if she ever had a hernia. She denied that she ever wore a truss, or had a rupture.

But, on examination over the crural region, a fulness of considerable size was felt, which, on moderate pressure, was found very sensative. This she said she had since childhood; though now, it was more painful than ever before. It was clearly apparent to me, that she had a strangulated femoral hernia, and I was determined to ascertain, in this untoward case what could be accomplished with cocaine, for with ether anæsthesia, it was clear she would never react.

Cocainization was employed in the usual manner. The hernia proved to be an epiplocele with a small knuckle of intestine, which had become tightly constricted just outside the fulciforne process of the femoral canal. The dissection was tedious and difficult; but she at no time, complained of pain. After the operation, by the aid of stimulants and artificial heat, she promptly reacted. Her recovery was rapid and uneventful.

Case Two.—October 12, 1891. The patient was a female, 61 years old, who was suffering from strangulation for nearly two days, when I saw her. Everything had been done to try and reduce the hernia, but without avail. When grave symptoms set in, and she had become very weak, she consented to an operation, and I was called in. On examination, it was found, that she had an irreducible femoral hernia, which was of small volume, lodged in the left side.

With the aid of the attending physician, the parts were prepared and cocainized, and an operation was performed. As this had been a recent extrusion, and there were no complications, the operative steps were simple and rapidly carried out.

With this, as in the preceding case, a radical cure was superadded to the manipulation, for relief of strangulation. After the operation the vomiting ceased, and she expressed herself as greatly relieved.

Everything went on well until the third day, when the abdomen suddenly became tympanitic, and the temperature went up. She died on the evening of this date.

A *post-mortem* examination was denied. There was no theory which would account, for the sudden fulminant type of peritonitis, which supervened and cut off life, except, that perforation of the intestine had occurred after reduction.

CASE THREE.—December 11, 1892. Male patient, 29 years old, had inguinal hernia on the right side, for several years; for which, until the past six months, he had worn a truss. He entered the hospital at nine o'clock in the evening. Just before noon, on this way, while at stool, he unavoidably forced the rupture down. He first tried to reduce it, but failed, and called in a practitioner, who after many vain efforts at taxis, gave it up, and sent him to the hospital in an ambulance.

On examination, it was found that he was suffering from a complete inguinal hernia, on the right side.

Although, in this case the period of strangulation was short, yet the constitutional symptoms were well marked.

With the coil of intestine which had escaped, there was

a large mass of omentum. This was well drawn down, ligated high up, on a level with the internal ring, and cut away. Operation for radical cure superadded.

Our local analgæsic acted perfectly. In all those cases, in which we employ cocaine, locally in strangulation, when the constriction is released, the patient is at once conscious of a great sense of relief. In this instance, our patient made an uneventful, and complete recovery.

Case Four.—Patient, 52 years old, had an inguinal hernia on the left side, for years, and always wore a truss. I was called to see him, in the evening of December 20, 1892. In the morning while making a heavy lift, his hernia suddenly slipped down in a large volume, and he was unable to replace it. Towards noon the family physician was called. He employed all the usual expedients to reduce the mass, but, without success.

When I saw him his general condition was not bad; but, he loudly complained of the pain that he suffered from, in the left groin, where the mass had escaped.

The hernial mass was very large, quite obliterating the penis, and causing a severe dragging sensation. when he attempted to raise. When the intestine went back he experienced so much relief, that he declared he felt as well ashe ever did. Radical cure superadded.

He lived in a long "flat." The operation was performed on the kitchen table. His room was situated at the other extreme end of the house. After the operation, when the dressings were adjusted, he got aff the table, unaided, and walked to his bedroom. His recovery, too, was uneventful.

CASE FIVE.—Patient, male, driver of a brewery-wagon, aged 23 years, was admitted to my service at Harlam Hospital, April 11, 1892. He never had a rupture to his knowledge, until the day before he entered the hospital.

On that morning, in making a lift, a fullness came down, in his right side, and gave him such pain, as to nearly cause him to faint. He was brought home, and medical-aid summoned. At first gentle taxis was made, which was followed by etherization, when greater force was employed.

After many attempts had been made, to reduce the rupture, which was on the right side, and he had been kept at home twenty-four hours, he was sent to the hospital.

He was seen by me two hours after admission, when, his condition was extremely serious. The integument over the right inguinal region was greatly discolored, from the violent pressure which had been employed, and the entire scrotum was greatly tumified. His general symptoms were very grave.

The abdomen was greatly distended, and everywhere sensative. He was incessantly vomiting and exceedingly weak. Indeed, he was in great shock. Now, over the inguinal region, although there was great tumification, of the parts along the planes, which should be occupied by hernial sac; yet, the usual tangible qualities of a hernia were wanting or masked.

He was now so extremely weak, that I hesitated to touch the case, at all, as the poor fellow was close on the moribund state; but, as intervention offered the only hope, the parts were cocainized, and the sac opened. Now the mystery was cleared up. The sac was stuffed full of the intestinal contents. The bowel had been ruptured by violent taxis, and then pressed up, to empty, into the peritoneal cavity. As our pa-

tient was now rapidly sinking, the wound was hurriedly closed. One hour later he succumbed.

A *post-mortem* examination was refused.

CASE SIX.—Patient, a letter carrier, 25 years old, was seen by me November 14.

Two days previously, I was sent for to operate on him for a strangulated inguinal hernia on the left side.

At this time, when first called, the rupture had been down for six hours.

Not being at home, the doctor, with an assistant, performed the operation, to release the strangulated intestine. After the operation the symptoms of strangulation continued, unabated.

Hence, why I was again called. The doctor explained to me that the patient was in a desperate condition; whether from perforation, internal obstruction, or general septic peritonitis, he was unable to say.

On enquiring as to whether he was in a condition to sustain an exploratory laparotomy, the doctor assured me he was not; and was rapidly losing ground.

From this I gathered that the case was quite hopeless. But I called on him. It seemed indeed, that the end was not far off. Vomiting, unquenchable thirst, and constant agonizing pain, had nearly exhausted him.

He begged pitiously, of me, to try and save his life. On examining the abdomen, it was found extremely tympanitic over all its area. His vomiting was fæcal and almost constant.

Now on inquiring what was the state of the wound, I was informed that it had united by primary union. But on remov-

ing the dressings a large fullness was found, just outside the internal ring. It was determined then, to re-open the wound and examine the mass. With this object in view, the parts were freely cocainized.

On dividing the edges of the wound, and tracing up the spermatic-cover, I soon came on the unopened sac, with its contents, which were yet locked outside the internal-ring; the constriction was divided, the imprisoned intestine liberated and returned, the sac excised and a radical-cure superadded. The relief was immediate and permanent. Within two hours he had a large evacuation. His ultimate recovery was entire, and he now carries the mail as well a man as he ever was.

CASE SEVEN.—Patient, a bar-tender, aged 28 years, was admitted into Harlem Hospital, August 12, 1893. This man gave a history of having had a fulness in his left groin, for several years. He said it would alternately, suddenly increase, and as rapidly diminish in size. One month before he was entered at Harlem Hospital, he had contracted.

Five days before he came to the hospital he noticed, that the fullness in the groin had suddenly swelled in volume. After this he had colicy pain, with more or less nausea. He called the physician's attention to this, who said that it had developed in consequence of the discharge from the urethra, and advised repeated hot poultices to be applied over it. But from day to day he became much worse, and finally came to the hospital, as his brother said, who came with him, "suffering from the *bad disorder*."

On admission, he was of an ashy white, and was clearly suffering from septicæmia. It was supposed, that the abscess in

the groin had broken, under the cuticle, and that its septic contents had made their way into the general circulation.

To me he gave a clear history of strangulated hernia. Its salient features were, the sudden increase in size of the bubonocele in the left groin, persistent constipation, vomiting and colicy pains, with now, well-marked peritonitis.

This was my diagnosis, after a very careful investigation of the case. And hence, directions were given to immediately prepare for a herniotomy, using cocaine hypodermically, for anæsthesia. At this time, his pulse was 140, temperature 104.6, and great sinking of the vital powers was evident. He was duly prepared, when, a long free incision was made over the greatest convexity of the mass, from the internal, ring to nearly the base of the scrotum.

As the scalpel penetrated the intercolumnar fascia, before the wall of the sac was reached, a foul, fæcal, ichorous fluid issued up through the incision. The sac was found rotten, and the confined intestine ruptured and extensively gangrenous. Now, all we could do was to leave an artificial anus, with the hope, that should our patient survive the profound toxæmia, from which he was suffering, in time, the breach in the bowel might be closed, and he would recover.

But fæcal resorption and protracted suffering had so crippled the vital powers, that there was no reaction. Our patient sank, early in the morning following operation. A *post mortem* was not permitted.

CASE EIGHT.—April 14, 1893. Patient, male 27 years, strangulated, incarcerated, inguinal hernia on the right side.

Patient had suffered from hernia since boyhood, and had

worn a truss until one month ago. He had been drinking hard, and during the afternoon, while violently pushing another man, he felt something give away in the right side. Immediately after, he became very weak and began to vomit, and suffer from very severe abdominal pains. At this juncture medical aid was summoned, when persistant attempts at taxis were made. Finally another physician was called to assist, when ether was given, but all to no avail, the rupture could not be reduced. At about 7 o'clock at night, an ambulance was called, and he was conveyed to Harlem Hospital.

When I saw him, two hours after admission, he was suffering greatly from shock. The extremities were cold, and the pulse scarcely perceptible. He was at once prepared for an operation under cocaine.

In this case the dissection proved very tedious, for, we found the sac had come down, not, as is most common, on one side of the spermatic cord, but directly through the center of its anatomical elements.

So that on one side, we came on to the veins which were very varicose, on the other side, the artery; underneath, lay the vas-deferens, and immediately anterior was the spermatic-nerve.

Notwithstanding, the extra time consumed in opening and decorticating the sac, our patient at no time complained of pain. Radical cure was superadded.

Patient made an excellent recovery.

CASE NINE.—Patient 56 years old, captain in the Fire Department, admitted to Harlem Hospital, August 5. Had

had hernia in the inguinal region, for many years, and worn a truss from time to time but not constantly.

At about noon on the day of admission, his rupture suddenly came down, in large volume. Two physicians came to his attendance, but after spending more than two hours, in forcible taxis, without and with ether, they gave up the case and turned it over to the hospital.

He was admitted late in the night; but, as the symptoms of strangulation were not urgent, he was not operated on, until the next afternoon. In this instance the extruded mass was very large; consisting mainly of omental tissue, which, had in places become very adherent to the protruded intestine. These adhesions were each, carefully detached, the constricted bowel was returned, when the omental mass was amputated high up, the stump being fixed in the ring.

The sac bisected into four loops, these being secured in two separate knots, the stump being now completely enclosed, by the homologous application of the peritoneal investment, was solidly closed in over, by the cellular membrane and integuments.

Our analgæsic was entirely satisfactory, though the operation occupied more than three quarters of an hour, in its performance.

Recovery was rapid, the wound closing in by primary union, and he left the hospital on the thirteenth day. Radical cure superadded.

CASE TEN.—Patient, a female, 57 years old, was admitted to hospital September 28, 1893, strangulated femoral hernia in left side. Hernia strangulated for six hours. In intense

shock. Persistant vomiting, extreme thirst, with the hyppocratic expressions, so expressive of peritonitis.

As strangulated hernia is altogether a much more serious accident in the female, than in the male, and quickly mortal, if not relieved early; as soon as possible, everything was placed in readiness, no time being lost in making preparation, for operating. In a little more than an hour after admission, the construction was divided, under cocaine-anæsthesia.

The protrusion consisted of a coil of intestine, only. The walls of the intestine were so congested and tumified that, it at first, seemed doubtful, whether they preserved their vitality, and ultimate perforation might not succeed their return. The operation occupied just 25 minutes, from the time cocainization was complete, and the canal was sealed. The radical cure was superadded by the same procedure, of homologous utilization of the sac, for obturation, as, in the preceding case.

Our patient's, general condition was much better after the operation was ended, than before it was commenced. But, as the knots of the sac sloughed, at the external ring, convalescence was retarded, though the parts ultimately cicatrized, and she left the hospital, the parts solidly healed, four weeks after entrance.

CASE ELEVEN.—Patient, a waiter, 26 years old, was suddenly seized with a strangulated inguinal hernia, on the left side, on the afternoon of September 11, 1893.

The patient had worked all night previously, and went to bed early in the morning. He awoke and dressed at about four in the afternoon, when he went to stool. Here, while straining, he felt his hernia come down in large volume. In

vain, he tried to return it. Then a practitioner was called in, who spent nearly two hours endeavoring to reduce it by taxis, baths, ether injections, etc.

Failing, he recommended that an ambulance be called, and the patient sent to a hospital. I was now sent for, reaching the house at 11 P. M. I advised immediate operation; as I saw by the discolored, tumified state of the integument, that quite enough taxis had been employed. I sent out for one assistant. An operating table was extemporized, and operation was performed, in the usual manner, by the aid of cocaine alone; never did it work more perfectly in my hands. Our patient had an indirect, incomplete left inguinal hernia. On dissection, we found the extended intestine intensely congested, with the sac widely distended by a blood clot and serum.

Immediate relief was experienced, on release of the bowel. Radical cure was superadded by the same method of homologous obturation, as in preceding cases.

The parts united by first intention, and in three weeks he was able to be up, and about, in his usual good health.

CASE TWELVE.—Feb. 19, 1893. Patient, a truckman, 36 years old, suffering from left inguinal hernia, non-strangulated. He had had a rupture for several years, which he found, of late, as it came down, was more difficult to return. When it descended the last time, it gave him great pain, at which time I was sent for. It could not be reduced. As there were no serious symptoms present, tentative expedients were resorted to, as the patient was not disposed to have an operation performed.

The following day, as the hernia yet remanied strangulated, he was sent to the hospital, where in the afternoon, I operated on him; employing cocaine analgæsia locally, over the operative areas.

On dissection, an immence mass of omentum was exposed, which had been tightly nipped, at the internal ring. This was freely released and then cut away; as far up as possible; the stump being preserved to obturate the portal of escape. The parts were all immediately closed in, without drainage. Union was prompt and his recovery uneventful. He left the hospital two weeks after operation; when the wound was well healed.

Case Thirteen.—Patient, 27 years old, admitted to hospital Oct. 20, 1893. Strangulated inguinal hernia on the left side.

The hernial mass was of vast proportions and exceedingly painful to the touch. He had a hermia on this side, for several years, but always kept it up with a truss.

In the morning, of September 20, he was suddenly, and without warning seized, while he was walking on the side-walk, near where he lived, with violent pain in the hypogastrium. At the same time he discovered that his hernia had come down in large volume; though, he had a truss on. The pain was so intensely agonizing that he had to make for a near stoop, and rest on the steps. But, his pain becoming more and more severe, and his cries of anguish louder, a policeman was called, who summoned an ambulance, and sent him to the hospital. He was entered just before twelve o'clock.

On admission, the general symptoms were very urgent.

His pulse was 130 per minute, and his temperature bounded up to 105°. Hypodermic injections of morphine were given him, moderate effects at taxis were made, and iced applications applied, over the large tumor. As it could not be reduced by taxis, and his condition was becoming rapidly worse, he was prepared for operation.

The hernial tumor was very large and tense, with the abdomen everywhere hard and distended. Vomiting was almost continuous, and he constantly clammored for cold drinks. On exposure of the sac, under cocaine anæsthesia, a very considerable extrusion of several coils of the intestine was reached. These were widely distended and their walls intensely engorged. At this stage there was no change in color or consistence, of the intestinal coats, suggestive of gangrene.

On opening the sac and exploring the canal, it could not be said, that there was any special point of constriction; but, rather a want of correspondence, between the proportions of the tubular passages and the escaped viscera.

The bowel had been partly twisted on its own axis, in such a manner, as to render its return quite impossible; until, this was overcome by direct manipulation.

When the intestine was exposed and the canal widened, by freely dividing the inner-pillars of the external-ring, an accident occured which rendered the complication of the operation very difficult. Just at this juncture, he was sized with a violent attack of retching, and forced down another considerable mass of the intestine. These were quickly enveloped in warm, moist towels. The entire mass now so resisted manipulation for return, that it was only by gradually emptying the

bowels contents, gas and fluids, backwards, into the intestine, yet within the abdomen, that I was able to finally, reduce the whole mass; which towards the end went back with the same gurgling sound, as in cases, wherein, we reduced by taxis over the integument.

He immediately ceased groaning as the hernia went back, and expressed himself as greatly relieved. The radical operation was superadded. That evening his temperature fell to 99°. In the morning he had a large alvine evacuation; having slept well through the night and retained all the liquid food given him.

On the second day after operation, symptoms of general peritonitis, set in, and he died the following morning.

A *post-mortem* examination, twenty-four hours after death, a perforation of the coil of intestine which had been strangulated was found, with free escape of the fæcal matter, into the peritoneal cavity.

Comments on Cocainization in Strangulation Cases; Especially the Thirteen Cases Here Reported.

Although cocaine locally employed is the safest anæsthetic in strangulation cases of hernia, it may be also utilized, in any type of non-strangulated hernia, when there are good grounds, for rejecting pulmonary-anæsthetics.

It will be noted with the list of cases, here recorded, that since my first operation for strangulation, under cocaine analgæsia, on June 7, 1891, there has been no death from operative-shock, in the thirteen cases. And, that of the four deaths,

reported, in all, but Case Two, of strangulated femoral hernia in the aged female, the cause of death could be clearly accounted for.

Here, we were left in doubt because an autopsy was denied us.

In every instance except this one, there was no evidence that the operation could, in any manner be charged, with the mortality.

But in the case of the old lady, as she survived until the third day, it might be assumed that the wound had been infected, etc., in operation, and that perforation could scarcely occur, so late.

Mr. Bowles, however, tells us, that we may have perforation of the bowel, after operation for strangulation, as late as the tenth day (*Lancet*, June, 1893, p. 294).

In Case Thirteen of this series, it was most remarkable, how, after a strangulation of but four hours, the intestine could have sustained such damage to its integrity, as to break down and cut off life, just at a time, when all operative danger was passed. It might be said, that in this case, when serious consecutive symptoms followed, a laparotomy should have been immediately performed, and an anastomosis made. But, our patient's condition was such as to entirely preclude it.

From this last case we witnessed a renewed confirmation of what experienced operators have always declared, viz., that a strangulated hernia is not always dangerous, in proportion to the period of time, since strangulation set in, as the quality of the factors in its *ætiology*.

This we saw again verified, in the case of the young letter-carrier who was incompletely operated on, and whose intes-

tine had been caught in the internal ring, for nearly four days; yet, on its release, he made an excellent recovery.

In these thirteen cases of operation for strangulated hernia, there were four deaths, or 30.76 per cent.; mortality.

One death was caused by rupturing the bowel, by taxis, befere operation.

One death was caused by gangrene of bowel, *in situ.*

One death was caused by consecutive perforation.

One death's cause was undetermined.

None directly due to operation.

CHAPTER XXI.

COCAINIZATION IN GENITO-URINARY SURGERY.

Cocaine is at the present time, largely employed in male genito-urinary surgery.

Quite a few cases of mishaps have been reported, from its use in the urethra. But, it is my impression that these accidents were rather attributable, to its abuse or mal-administration, than to its toxic properties.

No doubt, in not a few, it was the result of the peculiar, inherent intolerance of the genital mucous-membrane, to any description of manipulation.

The class of lesions, in which it may be utilized in genito-urinary surgery, may be grouped in two general divisions.

First, in those general lesions which involve the internal parts and genital appendages.

Secondly, in those which are located, on any part of the vesico-urethral mucous-membrane, or are caused by the spread of an infection, into the contiguous parts.

Of the first, may be enumerated, operations on the prepuce; for phymosis, paraphymosis, or circumcision.

For the treatment of spermatic varices; for the radical cure of hydrocele, or all other operations on the scrotum or testis, except perhaps, castration.

Cocainization is generally more valuable in operations or manipulations which involve the urethra.

When properly employed, it is of great value in treating stricture, whether we select gradual dilatation, divulsion, or incision. When we propose to employ it for these latter purposes internally, we should first cleanse the urethra carefully, with a warm, weak antiseptic solution. Then, the urethra should be emptied as completely as possible, when we are ready for cocainization. If our patient have a tight stricture, we need have no fears of any of the solution reaching the bladder.

It has been my custom, to use only a one per cent. solution; injecting into the urethra from one to two drams; after which, the glans penis is seized and the urethra so compressed, that the solution will come in contact, with the deep and superficial portions of it.

This kneading is continued for one or two minutes, when we milk the urethra empty, of all the residue of the analgæsic.

Now we are ready to proceed with instrumentation. By this plan the most sensative urethra is made tolerant. And, although the pain-sense is annulled, yet, the patient is conscious of the passage of a bougie or other instrument, and knows when it has engaged in, or passed, the stricture.

By this method, I have succeeded with the greatest ease, in completely divulsing or cutting a tight stricture, at one sitting, without any assistant, and with the most satisfactory results.

It is of no aid in those strictures, wherein we treat them, by gradual dilation; and, in which the urethra is amply tolerant.

Accordingly, when we employ it, we should enjoin the

same severe regimen, rest and after treatment, as we would when a general anæsthetic is employed.

As I have had no experience, in the treatment of vessical lesions, through the urethra with it, I am unable, to say, what the *rôle* of cocaine is, here. There have been good reports from it, when so employed; but, no doubt, in all cases, if we would avoid its dangers, we must be certain, that the residue of the solution is completely cleared from the bladder, before any operation is undertaken.

When the glands of the groin are infected from venereal poison, cocaine-hypodermication will enable us, to painlessly and freely incise the enclosing envelopes, gouge away the necrotic remains, drain and close in the parts.

In operations on the urethra for traumatic ruptnre, or perineal abscess, by this agent, we may in most cases rapidly and successfully deal with them.

In large cancerous ulcers of the glands, if we propose to destroy them by free cauterization; by first cleansing them, and then, applying over their nude surface, a pledget of cotton imbibed with a four *per cent* solution of cocaine, which, without it is attended with great torture, is now devoid of all suffering.

CHAHTER XXII.

COCAINIZATION IN GYNÆCOLOICAL SURGERY.

The field for cocaine, in minor gynæcological operations, is a large and ever growing one.

In a general way, it may be said, that it will suffice for all plastic operations, on the urethra and vagina. I have never employed it, in but one case of abdominal-gynæcology. This was in an operation, for a cystic growth in the broad ligament. It was unsatisfactory, and my patient succumbed from peritonitis, on the fourth day.

For intra-uterine operations; cervical-dilatation, grattage of the mucosum, for the removal of polypoid neoplasms, or, for the excision of the cervix, it fulfills all demands and greatly simplifies all those procedures.

In the opening chapters of this monograph, it was stated that cocaine was not generally satisfactory, when used in operations on females.

This holds good in general; but, in all the gynæcological operations, in which I have employed it, there has in no instance, been the slightest mis-adventure. This seems to me to be a singular clinical fact; which has no analogy, except, in the case of chloroform, which, when employed to secure euthan asia in labor, seldom, or never is the cause of serious accident.

I have repeatedly operated for laceration of the cervix, and the vagina with cocaine injections; besides treated vesico-vaginal and recto-vaginal fistula, dilated the cervix, curretted the uterus, and delivered large, sessile and pedunculated fibrous polypi, with the same agent; and never, with any mishap. The cancerous cervix has been drawn down into the vagina, and its ulcerating border completely cleared away with the knife, the patient, at no time suffering pain, or any drawback which interfered with, at least, temporary recovery.

Cocainization is much more rapid and effective here, than in many other situations; because, we use it conjoinedly, by injection, and on the surface, at the same time.

In many cases, we will secure quite deep surface analgæsia of a mucous-membrane, by freely mopping it, for a moment, with a four per cent solution. When our operation is to be delicate and tedious, and our incisions are to penetrate deeply, it will be more secure, to inject a certain quantity of a one per cent., solution, into the sub-mucous tissues. It will be necessary to observe in all these cases, that we have used the medicament, on the surface, but, a much diminished dosage need be injected.

Those painfull, vascular papillary masses which are sometimes clustered about the female urethra; the so-called caruncułæ, may be radically treated by excision without the least pain, by the simple swabbing of their surface, with a cocaine solution. Indeed, the number of local diseased conditions so common, about the urethro-vulva-vaginal outlet is so large, in which cocaine will entirely displace ether, that the limits of this contribution, will not permit of their enumeration and description.

CHAPTER XXIII.

COCAINIZATION IN THE SURGERY OF ANO-RECTAL DISEASES.

In divers contributions in current American medical literature, there have been presented some of my experience with the local use of cocaine in ano-rectal diseases.

My first attention was attracted to cocaine-analgæsia, by what I had seen accomplished by it in the Parisian Hospitals. In the Hotel Dieu, I first saw M. Ricard employ cocaine hypodermically, as an analgæsic, in the treatment of hæmorrhoids.

The anus and rectum were first thoroughly cleansed, when the cocaine solution was applied. With a peculiarly constructed speculum, which served the purpose of enabling one to inspect the rectum, at the same time, by a circular and see-saw movement, severely compress the hæmorrhoidal mass. After this, species of painless crushing was completed, the parts were again sponged. Now, the patient left the table and went on about his business.

The operator assured his audience, that by this very simple measure, of anal-dilatation and compression, the patient could at once resume his usual employment, and that it generally cured him. This simple, painless and radical operation

for hæmorrhoids, struck me, as an enormous improvement over the older, bloody and often unsatisfactory methods, commonly in vogue.

Having carefully considered the advantages and disadvantages of this scheme, I finally decided to fully test its efficacy, on my return home.

After a very short experience with it, enough was seen to strongly convince me, that for treatment of non-bleeding hæmorrhoids, internal or external, it was the most useful, of any method yet devised.

It is bloodless, and painless; there is no danger of secondary-hæmorrhage, infection, suppuration and fistulæ, as may occur, after any of those operations which entail cutting, caustics or the ligature.

As there are no pulmonary-anæsthetics employed, their dangers are entirely obviated. As there is no mutilation and no large open wound to heal, the operation makes but little impression, on the constitution; and, no long, tedious convalescence follows.

With but a slight modification on Ricard's plan, I now treat all simple cases of simplex piles. Instead of compressing the hæmorrhoids with an instrument, I crush each tumor, within its coats, with the index finger and thumb; besides, twist and stretch its pedicle, before its return within the syhincter.

Cocainization will answer equally well, with the most complicated as well as simple cases, though, our technique of operating is not the same.

It has answered admirably with me, in cases of fistulæ, fissure, condylomata and superficial epithelioma; of the lower segment of the rectum.

The technique for efficient local analgæsia in ano-rectal operations is essentially the same, as for operations, in the vaginal outlet, except, that as this district, when diseased, is exceedingly sensative, to any sort of manipulation, it is important, that every detail in administering the analgæsia must be carried out, in all its minutiæ.

The day before operation, the intestinal-tract should be freely cleared with a brisk purgative.

Our patient should be mildly inebriated, if possible. Now, being placed on his back, in a good light, we first scrupuously cleanse the perineum and shave the entire district about the anus. We will then request the patient to bear down gently, which will partly unfold the anal rugæ and turn out the lower hæmorrhoids. These are sterilized and dried; when we apply a four per cent., solution of cocaine, very lightly at first; then more freely, pressing the moistened cotton up to, and against the external sphincter for a moment. This will permit of the introduction of the warm, lubricated index finger of the left hand. This is pressed in gently to the webbing of the hand and fixed. The surface is now flushed again, when the hypodermic-needle is taken in hand. Now, the index-finger in the rectum is so bent, as to form a hook, when the largest hæmorrhoid is so pressed against the anus, that the point of the hypodermic-needle can penetrate it and deposit one or two drops of a one per cent., solution directly into its center.

This is repeated with each successive large hæmorrhoid, until, they are well inhibited to pain.

I make but four hubs and employ from seventy-five to one hundred drops by the syringe.

Cocainization complete, the external spincter is widely

and completely dilated. This part of the operation is indespensible; for, without it, it will be impossible to manipulate the internal parts, and the results will be very unsatisfactory. But, in an old chronic case, in which the sphincter has wasted in muscle substance, and it has an unyielding, resisting feel, we must make our distension very gradually and with caution, or we will lacerate.

The sphincter well dilated, we will easily roll out the hæmorrhoids. Now, their surface is again irrigated and dried, when the surface of all is once more lightly swabbed with a four per cent., solution of cocaine. At this stage of the operation, each hæmorrhoid is taken separately and crushed with sufficient force, to thoroughly break down all, but the external fibro-serous coat. This is done, as remarked previously, with the thumb and fingers of the right hand.

I designate this, pressure-massage. After being crushed, each tumor is severely twisted on its base and stretched. When this is systematically effected with each hæmorrhoid, the whole mass is turned back, within the sphyncter, a suppository of opium is introduced and a pad-support applied to the anus, with a T bandage to support it. This completes the operation.

In cases of internal hæmorrhoids or vascular papillomata of the rectum, this sort of local anæsthesia equally suffices.

Not long since, I was requested to operate on a case of complicated, internal, bleeding and external piles, for Dr. J. M. F. Egan of this city. The patient was a young married man, who was greatly exsanguinated, by the continued loss of blood, with each movement from the bowel.

In this case, after sufficient cocainization and dilatation,

the small, vascular, fungoid masses were each separately freely touched, with the thermo-cautery. Besides, each large, hæmorrhoidal tumor was seized, and treated in the usual manner. The patient at no time experienced any pain, and the performance of the operation occupied only a few moments.

Five years ago, for the first time, I saw cocaine employed as a local anæsthetic, by my friend Dr. T. J. McGillicuddy, of this city, in the treatment of rectal fistula. In simple, non-complicated cases, since that time, of rectal fistula and fissure, I have seldom employed anything else. In any deep, excavating, ischio-rectal sinuses, which require an extended dissection, we cannot rely on cocaine, but, these are unusual, and when encountered, they may be in those, who are the subjects of pulmonary tuberculosis, on whom, the propriety of any operation may be questioned. The rest which we can secure, after operation, on the rectum, by cocaine, the absence from vomiting, retching and struggling; and the clean, clear field for operation without the parts being besmeared by fæces, in the course of operation, are a great gain.

No accident ever happened, in any of my rectal operations, under cocaine, except, in one instance. A young man came to me complaining of the most intense, distressing pain in the anus, with a bunch of highly inflammed hemorrhoids, partly projecting though the sphyncter. He was placed on his back, and a pledget of cotton which had imbibed, about a dram of a four per cent solution, was lodged just inside the rectum.

I noticed that, in a moment he became deathly pale, and the radial pulse was almost imperceptible. In a moment I hastily removed the cocainized cotton; but, it was too late,

my patient was suddenly taken with the most alarming symptoms, and declared he was dying. He was given brandy freely by the mouth, and strong ammonia was placed under his nostrils. The face was douched with cold water; hot applications were placed over the heart, and the body was freely rubbed. After about ten minutes he commenced to react, and in a little while he was able to return home, in a coach. This accident taught me the useful lesson, of never leaving a saturated sponge or piece of cotton, again, in immediate contact with a mucous membrane, over any extended period of time, unless, the cocaine solution is very feeble.

CHAPTER XXIV.

COCAINIZATION IN THE SURGERY OF THE LOWER EXTREMITIES.

Except, for those peripheral neoplasms which occupy the various planes of the thigh and leg, cocainization is not of general application. But, there are exceptional conditions in the parts more deeply lodged; wherein, it might serve a useful purpose. Of these may be mentioned, the deligation of the femoral artery, in Scarpa's triangle, for aneurism. Here, the vessel, though commonly an inch from the surface, is readily reached, and lies imbedded in an atmosphere of cellular and adipose tissue, only.

Very generally, a popliteal aneurism, when not of a traumatic origin, is, but a local expression of a general degenerative atheroma of the entire arterial system; or, at all events, certain sections of it, which may supply various organs, vital to life; particularly the brain.

It is clearly manifest, that under these circumstances, any general anæsthetic, which entails excessive, vascular distention of diseased arteries, must needs greatly add to the dangers of an operation, performed under its employment. No doubt, in cases, heretofore set down, as, "death from shock or suppression of the urine," after a simple bloodless operation; the

underlying, fundamental factor has been chloroform or ether toxemia. Hence, in this class of cases, that a local analgæsic, when it can be effectually utilized, offers great advantages over any other; in which, the circulation is charged with a lethal substance, and serious vaso-motor disturbances, are almost certain to follow.

Cocainization in Tenotomies.

Those tendons which lie near the surface, as the ham-strings, tendo Achillis, the anterior and posterior tibial, and others, by the utilization of cocaine, may be painlessly divided. But, as in most cases requiring tenotomies, other manipulative procedures, must be superadded, which may give rise to great pain and occupy considerable time, unless, there are serious dangers involved, justice to our patient requires us, to give pulmonary anæsthetics.

Cocainization in the Surgery of the Foot.

Toe-amputations may be carried out under cocaine anæs-thetics; in traumatic cases with perfect satisfaction. But, with irritable or very young patients, in pathological conditions, it may be better, to give ether.

Cocaine serves an admirable purpose, in the avulsion of an in-growing toe-nail.

This is a common and very painful condition; for which, many palliative operations and schemes of treatment, have been devised.

But, there is none so promptly and radically curative, as

the total avulsion of one half, or the entire nail; according, as to whether one, or both borders of the matrix, is involved in the ulcerative process.

The toe is prepared for operation, by a thorough cleansing, down to the webbing.

It is now, isolated, by enveloping the entire foot, in a sterilized, gauze material and bandage. As the parts here are so extremely sensative, and the operative area of narrow proportions, I make an exception, and employ a *four* per cent. solution of cocaine. Everything being ready, the foot is placed on the operator's knee, while the patient sits up.

The great-toe is seized firmly between the thumb and the fingers of the left hand, when the charged syringe is taken in hand, and the needle sent in, under the nail, on a line which passes through the center of it. The point is sent down to, and about half a line, below the matrix. Now, it is arrested, when one or two drops of the solution is deposited.

The needle is then withdrawn, to within one or two lines of entrance; in the meantime, its path having been sprayed with from three to five drops of the solution.

Now, without withdrawing the needle's point, it is sent in, at an obtuse angle, on the inner side, withdrawn, and sent in again, in the same manner, on the external side; in the meantime, the needle-path being sprayed each time, as in the primary puncture; in other words, we make but "one hub and three spokes."

All this is but the work of a moment, when we are prepared to split the nail in two separate discs; by carrying the blade of the scissors down to the bottom of it, and a little beyond its matrix. At this stage, with a heavy, strong for-

ceps, each half of the nail is torn completely out of its bed, on one or both sides. Ordinary dressings are applied, and the case dismissed for the time.

But a few days since, a young gentleman came to me, with double inversion of the borders of the nail, of the great-toe. For months, palliative measures had been employed, but, with only temporary relief. He winced only, when the needle first went in. After the first drop of cocaine had been deposited, he had no more sensation, than though it were a dead substance.

CHAPTER XXV.

COCAINIZATION IN MISCELLANEOUS OPERATIONS.

The general practitioner, in a suburban village or country practice, should always carry about his person, the wherewith to induce cocainization, at a moment's notice; which means simply, that he will have in his pocket-medicine-case, a place for a few tablets of pure hydrochlorate of cocaine.

A hypodermic case is now a-days, a necessary part of one's ambulatory arsenal.

Armed with the few and inexpensive implements required, to induce cocainization, he will always be impressed with a sense of safety; and will be able to perform painlessly and promptly, many operations, which he might otherwise be obliged to neglect, and permit a continued suffering, or even death itself, in not a few cases.

As a general rule, when one gets into a certain rut, or routine practice, it requires often considerable determination and effort, to get out of it.

In the near past, it has been too common a practice, to etherize for everything; as though, it were totally devoid of danger, and furthered the patients prospects, in the way of recovery.

But, the infliction of moderate pain, in numerous conditions is salutary and necessary to relief. There are some patients who are immune to the action of cocaine; or, so resist, that its full effects cannot be realized; while on the contrary, there are others, who are more morbidly susceptible to it. With the former, if we will amply fortify our patient with alcoholics, no harm will follow, and the pain inflicted will be slight.

For the latter, unhappily there is no reliable prophylactic, when very grave symptoms arise; except, through the action of powerful stimulants; but, if we restrict the dose within a safe limit, and are not tempted to go far beyond it, we are practially safe, from accident.

The scope and purpose of this monograph will not permit of a description of all the lesions, of the body in which cocaine, will serve as a valuable substitute for ether or chloroform; nor is it necessary; for, after one has given it a few fair trials, it will soon be apparent, what its limitations are.

But, it may be well to remember, that effective cocainization has a technique, which must be mastered. Without this, our results will be very unsatisfactory, and the drug will be condemed and cast aside in disgust.

It is my firm conviction, that when the art of properly administering cocaine as an inhibitor of the pain-sense is mastered, and its virtues are more generally appreciated, the mortality after operations will be enormously lessened, and pulmonary anæsthetics will be employed, only in protracted capital operations.

Antiseptic and aseptic agents have enormously extended the operative field, and eliminated the chances of infection.

Now, if time will prove that a local anæsthetic has been discovered, which will obviate the dangers attending or following, the administrating of ether or chloroform, the advance will be along the whole line, and we may rest, content, that science has brought the art of operative surgery, to a very high degree of perfection.

CHAPTER XXVI.

MIXED ANÆSTHESIA, OR THE EMPLOYMENT OF PULMONARY-ANÆSTHETICS AS AN ACCESSORY IN LOCAL ANALGÆSICS.

With all our cases, in which, we propose to employ local-anæsthetics, it is important to deliberate carefully, on the leading features of the operation, about to be undertaken, the difficulties and dangers which may attend it, and the time which it will consume in its performance; besides, we should endeavor to gauge our patients susceptibility. If they are of the irritable, cranky, faultfinding class, the practitioner will act with the best judgment, if he takes no chances, and adminsters to the patient such an anæsthetic, as his friends prefer.

Cocaine is chiefly recommended, as a substitute for pulmonary-anæsthetics, because, it is a life-saving agent, and because in a vast number of very painful, but trifling conditions, from an operative stand-point; it enables us to painlessly explore and treat them, without putting the patient's life in jeopardy, as we do. every time anæsthesia is carried to full coma.

Now, if one is so unreasonable, as to loudly complain of the pain of a hypodermic-puncture, then, we should not in-

commode ourselves for him, but give him, with a free hand, the more lethal agent.

There are cases however, in which, when our patient is not refractory we may, on account of some unforseen difficulty, or unavoidable delay, be obliged to resort to a pulmonary-anæsthetic,

These are an untoward class; and the emergency is one which calls for special alertness, on the part of the anæsthetizer.

In all cocaine-operations, it is of prime importance, that the patient partake freely of a hearty meal, if he be of robust health.

A surgeon who is about to undertake anything, in the nature of a difficult operation, besides, preparing himself by ample study and reflection, should be in good physical form; and the sooner he operates after a substantial meal, the better. He certainly should not undertake a formidable operation on an empty stomach, or when oppressed by a sense of weariness.

Similarly, our patient for the local aæsthetic, should be in good tone, and besides, have his resisting powers reinforced, by bracing doses of an alchoholic.

Now, in pulmonary-anæsthesia on the contrary, the more hungry and weaker our patient, the more promptly will the chemicals act.

In fact, it is this impaired physical candition which undoubtedly adds to their dangers.

But, the full stomach adds great danger in ordinary circumstances, to the administration of ether. Nature resists the toxic action of it, first, by a free emesis; so that, perhaps at a stage of the operation, when perfect quiet is most im-

perative, every muscle is thrown into spasmotic contractions. Besides, if great caution is not observed, the vomited ejecta may be sucked into the bronchial tubes, so as to induce immediate suffocation; or, if this be escaped, a septic pneumonia may perchance follow, and cut off our patient, when all danger of operative manipulation is past.

When therefore, etherization must follow cocainization, more than ordinary precautions must be observed in its administration, and, it should not be resorted to at all, unless, in cases of great urgency, which will admit of no other expedient.

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