must be caught in the wound being the posterior scapular.

The method followed by the writer corresponds in its main features to that advocated by Paul Berger in his monograph of 1887, and has been sufficiently described in the account of the operation.

The special points in the technique which the writer would insist upon as important are, first, the ligation of the artery before the vein, then the elevation of the extremity, so as to empty it as far as possible of blood before ligating the vein. The artery and vein in this instance were both secured by two ligatures of coarse twisted silk, tied about one fourth of an inch apart, to avoid the possible hemorrhage from the slipping of a single ligature, and the vessels were divided one fourth of an inch distally to both, a clamp being placed upon the vessels to avoid hemorrhage from their distal ends.

In this case the man's excessive muscular development made the wound required to reach the vessels very deep, and the operator was greatly aided by section of the clavicular and upper sternal portion of the pectoralis major. In the deep wound the artery was entirely covered by the distended axillary, cephalic, suprascapular, and superior intercostal veins, which had to be very carefully freed by blunt dissection. This procedure was made much simpler and safer by section of the muscle, which the writer would recommend to others in similar cases.

The disarticulation of the clavicle at the sternal end, as advocated by LeConte,² seems to the writer advisable only in case such division of the muscles fails to give enough room, as it sacrifices more of the attachments of the sterno-mastoid and involves the risk of wounding the innominate vein.

The second point in the technique which is worthy of note is the cocaineization of the trunks of the brachial plexus before division. The physiological blocking effect of cocaine when injected into the nerves of the extremities proximal to their point of section has been so conclusively shown by the admirable experimental researches of Dr. George Crile³ as to leave little doubt of its value in the prevention of shock, and to lead to its general adoption. Certainly in this case the section of the nerves was attended by no effect on the pulse perceptible to the examining finger. It is to be regretted that the effect on blood pressure was not noted by the use of the Riva-Rocci apparatus. Cocaineization of the nerve trunks is a very simple procedure, as it requires only a few seconds to inject a few drops of the solution into the loose tissue of the nerve trunks, which quickly bulges the injected portion into an edematous translucent bulb, which should entirely surround the nerve, thus showing that all the fibers have been brought in contact with the solution.

A word as to the indications for operation. The principal indications are:

(1) In the majority of cases of malignant disease of the humerus, and especially any that involve the tissues about the shoulder joint.

(2) In malignant disease in the axilla involving the axillary vein, which cannot be ligated without sacrificing the arm.

(3) In extensive injuries, usually machinery accidents to the arm, shoulder and scapula, in which the scapula has been partially or completely torn away, or the skin over the deltoid has been destroyed so that it is not available for the covering of an ordinary shoulder joint amputation.

The case presents several points of interest, not the least of which is the apparently close relation in time between the development of the tumor and an injury to the arm. The early paralysis of the median nerve, and the fact that that nerve and the cords which form it were actually involved in the growth while the other nerves of the brachial plexus were affected simply by pressure, point probably to the tumor as of primary origin in that nerve.

The attempted removal of the axillary mass was valuable as an exploratory procedure, giving an exact idea of the nature and limits of the tumor, and of the extent of the operation necessary for its removal. Notable in connection with this operation was the ease with which it was possible to close the rent in the axillary vein by suture.

The rapid growth of the tumor, and its juxtaposition to the great vessels at the base of the neck and thorax, would probably have rendered any other treatment than that by the operation adopted unsuccessful. Even should recurrence take place, the patient has been rewarded by a complete freedom from pain for a considerable interval.

THE DIAGNOSIS OF GONORRHEALU RETHRITIS.

BY ALFRED H. GOULD, M.D., BOSTON,

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The introduction of the gonococcus into the urethra rarely causes any symptoms for the first twenty-four hours. After this period a sense of irritation and a moisture at the meatus may be observed, which increases in intensity until, at the end of two to four days, it has developed into a purulent discharge.

The length of the incubation period is usually fairly constant, but occasionally may show wide variation. It depends upon the rate of production of, and the susceptibility of the urethra to, the toxin.

The toxin is elaborated by the living, and is contained in the dead, bacterial bodies (Christmas). The production of toxin probably commences at once in the urethra, but not in sufficient quantity to irritate the urethra until a number of colonies have developed. From this assumption it follows that gonococci may be present in the urethra before there is any pus formation, and the recognition of their presence at this time allows measures to be taken to head off an acute urethritis. The presence of the gonococci may be recognized by the examination of the urine by means of coverglass preparations and by cultures. Stained preparations of the sediment will show the presence of different bacteria. The predominating organism will be a coccus that decolorizes by Gram, and which frequently is arranged in tetrads. Absolute proof that this prevailing coccus is the gonococcus can only be established by culture.

² *Annals of Surgery*, October, 1902.

³ *Problems Relating to Surgical Operations*, Philadelphia, 1901.

The writer has, however, not been able to obtain a growth of the gonococcus at this stage.

After the urethritis is thoroughly established, the identification of the gonococcus is easy on slide and by culture. It is of interest, however, to study the changes which take place in the pus cells during this period. In the earliest stages the gonococci are extracellular. The presence of pus at once gives the gonococci an unlimited medium in which to multiply.

They invade or are taken up by these cells and rapidly proliferate. The leucocytes at once begin to show degenerative changes. The nuclei increase in size and react to stains less readily. This brings out the internal structure of the nucleus so that its usual uneven coloring is exaggerated into clefts and vacuoles. The gonococci continue to grow inside the cell membrane and spread over the whole leucocyte including the cytoplasm and the nucleus. Later the gonococci seem to penetrate the nucleus itself, until each pair of bacteria is surrounded by a clear, sharply defined halo, which cannot be stained. The nucleus may, in this way, be completely destroyed, while the protoplasm, though loaded with cocci, does not wholly lose its staining properties. Finally only a remnant of the nucleus survives, as a narrow strip flattened out against the cell membrane until the last of the nucleus disappears and the cell degenerates into a mere clump of bacteria, imbedded in a faintly staining cloud of protoplasm. The gonococci are soon liberated from the cell, and in their turn form nuclei for new colonies.

Some sort of immunity is probably acquired by the mucous membrane, and the gonococci seek its glands and deeper tissues for food. The pus becomes thinner and has a washed-out appearance on the slide. The extracellular equal or supersede in number the intracellular bacteria. Other organisms begin to get a foothold, until a sub-acute condition develops, when the sediment is largely pus, desquamated urethral cells, mucus and various bacteria. Under treatment this cycle is short, but the various stages can be made out.

The sub-acute inflammation gradually subsides into a chronic condition, when the urine is more or less clear and contains shreds. The value of shreds as a rough method of gauging the urethral condition is great, but is only half understood by most practitioners. Shreds indicate fairly exactly about how much pus is floating free in the urine. This pus may not be of sufficient quantity to cloud the urine, but it will form a definite sediment when centrifugalized. The microscopical examination of the shreds themselves is not important in the demonstration of the gonococci, for the gonococci are rarely found in the shreds but in the pus cells, which are floating free in the urine. The prevailing idea that the gonococci are to be sought for in the shreds is erroneous. It is important to notice whether or not the shreds consist of pus. The shreds, which are heavy and sink to the bottom of the urine glass, are made up of pus, and these are associated with the largest quantity of free pus in the urine. The meaning of shreds, therefore, is a secondary one in the study of urine. The general sediment contains practically all the pus and bacteria.

The writer has pointed out the assistance that may be given by an examination of the sediment in cases

of suspected early urethritis. Next in importance to the early examination for diagnosis is the late examination of the sediment for prognosis. There are many cases where it is necessary to ascertain whether or not a patient is cured, or whether an intractable gleet is due to the gonococcus or to other causes.

The demonstration of gonococci in a very chronic discharge is repeatedly baffling, for two reasons: First, the organism may not be present in the discharge at the time of examination, or, finally, the gleet may be due to some other bacterium.

The gonococci can be cultivated in a fair proportion of the chronic cases, if they can be found in the sediment. A successful cultivation is assisted by scarcity of secondary organisms and by some form of acute exacerbation. When an old discharge has persisted for a period of months or years without exacerbation, gonococci are rarely found. On the other hand, no scientific aid should be disregarded in these doubtful cases. Repeated trials will often be rewarded by success.

The study of coverglass preparations of the sediment is generally as satisfactory as of cultures; but the latter should never be omitted, since, if positive, it absolutely establishes the identity of the infection.

The method which the writer has found reliable in the routine examination of gonorrheal discharge is as follows:

The meatus is cleaned with water and the urine passed into a sterile test tube. This specimen is centrifugalized in two sterile centrifugal tubes, and the overlying fluid poured off. The character of the sediment varies with the quantity of pus present. In the process of centrifugalization the phosphates come down and drag all the free pus and bacteria with them into a gelatinous precipitate. Cultures and coverglass preparations are made from this mass. If few gonococci are found in the first tube, the second tube is treated in the same manner. The Gram stain should always be used for purposes of diagnosis, since there is no other positive method of recognizing the gonococci on the slide.

In making the culture media, only sterile, albuminous body fluid can be utilized. The most practical and the most easily obtainable is hydrocele fluid. It contains no fibrin ferment and forms no clot. This fact renders it less open to contamination. It is essential to collect the fluid under rigidly aseptic precautions in test tubes. After twenty-four hours in the thermostat, the infected tubes can be thrown out and the remainder kept in the ice chest until ready for use. Gonococci grow both in liquid and in solid media easily. If liquid media is used the hydrocele fluid is mixed in equal parts with bouillon. Agar-agar is employed for solid media in strengths from 2% to 2½%. The reaction of the medium should be about + 1 (scale of the American Public Health Association). The growth upon strongly alkaline media is rich and rapid. It is short-lived, and quickly shows degenerative forms. Gonococci can be cultivated in reactions varying from + 1.5 to - 2.0.

The agar is melted, cooled to 40° C. and mixed while liquid with the hydrocele fluid in the proportion of 2 agar to 1 hydrocele. The tubes are then slanted and allowed to remain for twenty-four hours. As much hydrocele may be put in as the

agar will stand, but too great dilution will cause the slant to slump when put into the thermostat.

The writer wishes to express his obligations to the gentlemen of the Surgical Staff of the Out-Patient Department of the Massachusetts General Hospital, and to Dr. Gardner Allen of the Boston Dispensary, for their courtesy in furnishing material for this work.

The photo-micrographs were taken by Mr. Louis S. Brown of the Clinico-Pathological Laboratory of the Massachusetts General Hospital.

CREAM FOR THE HOME MODIFICATION OF MILK.¹

BY CHARLES W. TOWNSEND, M.D., BOSTON.

It is, of course, a trite observation that if we dilute cow's milk so as to obtain the proper amount of albuminoids for infant feeding we obtain too weak a fat—hence the need of starting with cream, and cream of a known percentage.

There are various ways of obtaining this cream, all of which have their advocates, and the importance of the subject has led me to try to find the most accurate, and if possible the simplest, method for obtaining this cream. In furtherance of this end the analyses of over a hundred specimens of cream with the Babcock tester have been made for me by Dr. Wilder Tileston, for whose careful and conscientious work I am greatly indebted. To ensure accuracy, two separate analyses were made of each specimen.

The methods for obtaining cream for infant feeding may be set down as follows:

- (1) Cream by the centrifugal process.
- (2) Gravity cream or top milk obtained by siphonage.
- (3) Gravity cream obtained by dipping off the top.
- (4) Gravity cream obtained by pouring off the top.

(1) CENTRIFUGAL CREAM.

The advocates of this cream for the modification of milk think that the process has no detrimental effect on the cream, and that the supposed accuracy of percentage is of great advantage in making up the modifications. The following table is of nine specimens of centrifugal creams, bought in the open market of several responsible firms. In each case the cream was stated to have the percentage given in the first column, and the results of the analyses given in the second column show, with few exceptions, considerable variation—greater in most cases than, as will be seen later, is found in gravity cream obtained at home.

Clinical experience may, of course, be misleading, but must be the final test; and there are many, myself among the number, who have failed to obtain as satisfactory results with centrifugal as with gravity cream in the feeding of infants.

TABLE OF PERCENTAGES OF CENTRIFUGAL CREAM.

Per cent stated.	Per cent found.
10.....	15.0
16.....	14.1
18.....	16.9
20.....	17.0
20.....	20.2
20.....	16.5
40.....	34.3
40.....	35.3
40.....	35.3

(2) GRAVITY CREAM OBTAINED BY SIPHONAGE.

A glass siphon filled with sterilized water is introduced into the bottle or can after it has stood six to eight hours and the lower milk drawn off, leaving the cream. In applying the test of simplicity to this method, it is evident to any one who has siphoned milk himself that the process is not a simple one, or one that can be easily and safely performed by an untrained and ignorant hand. To keep the long glass tube clean and sterile, to introduce the tube filled with sterile water through the cream, to draw off this water into one vessel, the milk into another, and to stop the rapid flow of the siphon at exactly the right point, and withdraw it through the cream, is not an easy process. I have known of a rubber tube being advocated as simpler for siphonage, which reminds one of the filthy condition of the interior of rubber tubes used in the old-fashioned feeding bottle, and suggests suction as a method for stauting the siphonage.

As to accuracy, if the flow is stopped at exactly the right spot, the analyses obtained from different bottles of the same milk vary but little, but of course considerable variation would occur if the flow were stopped too soon or too late. Thus the analyses of the cream obtained by siphonage from two bottles of the same milk (upper 8 oz.) was 13.5% and 13.7%, and in another case 12.9% and 12.5%.

The method is, therefore, an accurate one, but one requiring considerable intelligence to perform accurately and safely.

(3) GRAVITY CREAM OBTAINED BY DIPPING OFF THE TOP.

Dr. Chapin's dipper,² made either of tin or aluminum, can be used for this purpose. This is a much simpler and easier process than siphonage; and the dipper is safer, as it is more easily kept clean. As to accuracy, it was found that a considerable variation could be obtained, depending on the care with which the dipper was lowered into the bottle. Thus the upper 8 oz. dipped off with great care in one case showed 14.2 of fat; the same milk dipped off from another bottle carelessly, although measured accurately, showed 13.6. In another case the analyses were 16.1 and 14.3%, respectively,—a variation of .6 in the first case and 1.8 in the other.

This variation is not great, and can be avoided by almost any one who is willing to take pains to lower the dipper slowly as it fills, and not to plunge it carelessly below the surface.

¹ Read at the meeting of the Boston Medical Library, Feb. 23, 1903.

² "Home Modification of Cow's Milk for Infant Feeding." H. D. Chapin, New York Med. Journ., Nov. 4, 1889.