THE GONOCOCCUS:

Its Pathological Effects and their Treatment.

A THESIS

PRESENTED TO THE UNIVERSITY OF EDINBURGH,

BY

C. A. B. HORSFORD, M.B., Ch.B.

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P R E F A C E

The subject of Gonorrhoea is one so vast, as to render a complete account of it quite beyond the scope of this work. I have decided therefore to give prominence to the pathological aspect of the disease, and shall only emphasise those clinical facts, which I have found to be of practical importance. With that object in view I have given a full account of the Bacteriology of the Gonococcus, the rest of the work being of necessity considered in brief. In the absence of good drawings and photographs, I have ventured to illustrate the Thesis, by microscopic slides described in detail, which will accompany it. In conclusion I may state that my opportunities for the study of the subject, commenced two years ago while for six months, I acted as Civil Surgeon at the Military Hospital, Portsmouth. During the past year as Resident Medical Officer to the Royal Albert Hospital, Devonport I have had entire charge of the Female Lock Department. Lastly through the kindness of the Surgeons of the Royal Naval and Military Hospitals of Devonport, I have been able to Study a large number of cases in men.

Royal Albert Hospital
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C. A. B. Horsford

THE GONOCOCCUS

The Gonococcus is a minute micro-organism, which is now conclusively proved to be the cause of Gonorrhoea and many of its complications. A respectable antiquity is attributed to Gonorrhoea, for it is mentioned in many ancient writings, including those of Hippocrates and Celsus. The Gonococcus on the other hand has a very brief history. The Germ theory of disease by the ~~head~~ aid of Listerism in 1875, and Koch's Work on Traumatic Infectious Diseases, had scarcely taken a firm hold on the Scientific World, when in 1879 the Gonococcus was discovered and described by Neisser. It was also described about the same time by Bouchard. It was therefore one of the first pathogenic organisms to be discovered. This "Micrococcus Gonorrhoeae of Neisser" is found in the pus and frequently in the tissues affected with Gonorrhoeal Inflammation. There is now no doubt that the organism is the specific cause of Gonorrhoea. The Cocci are always present in gonorrhoeal pus in which they have a constant and definite relation to the cells. Their number vary with the stage and severity of the attack. Pure cultures obtained from artificial media have on several occasions been inoculated into the human urethra, resulting in a typical attack of gonorrhoea. It thus conforms

to Koch's postulates and its causal connection is therefore established.

Biological Characters

The gonococcus is very minute, not motile, is not provided with flagella and does not form spores; it is somewhat larger than other micro-cocci, measuring in its usual form 0.8 to 1.6μ long and 0.6 to 0.8μ wide. It most frequently occurs in pairs and often in tetrades but rarely as single cocci; Each half of the diplococcus is described as being biscuit shaped. Together they resemble two coffee beans so placed, that there flattened or concave surfaces are in apposition. The interval between the cocci thus formed is a narrow slit or oval the width of which increases with the age of the diplococcus. The size of each coccus also increases until its full developement is reached; each then divides into two by fission, at right angles to the slit. A tetrad is thus formed and the separation of its components results in diplococci or monococci. Such division will explain how frequently the cocci are found not only in twos and fours but in groups. This double- bean shape which the organism assumes is not specific for the gonococcus but other diplococci correspond in their morphology in every detail with it as has been shown by Bumm. (1). The gonococcus is a true parasite, and its habitation is limited to certain tissuesof the human body only. It retains

(1) Veit's Handbuch der Gynak. Bd I.

its vitality for only a brief period and is with difficulty grown on artificial media. McFarland however states that they are not easily killed and withstand heat well(1). Turro has succeeded in producing a urethritis in the dog but usually inocculation of pure cultures into the urethra of lower animals has been without result (2). When cultures are injected into the peritoneal cavities of lower animals they produce little supurative action and soon die. The organism may be found in pus, taken from the urethra of the male or female, from the vulva, vagina, endocervium, endometrium, Fallopian tubes, conjunctiva &c, when these parts are the seat of true gonorrhoeal inflammation.

Microscopic examination.

In order to observe clearly the morphological characters of the gonococcus, a microscope fitted with a 1/12 in. oil immersion lens, Abbé condensor, and a No 3. or 4, eyepiece is necessary. Such a combination would show the object magnified about 1000 diameters. With a magnification much lower the mesial slit will not be clearly made out. Cover glasses having been thoroughly cleansed, preferably by the method of Ermengen (3) should be thinly covered by a layer of pus by any of the ordinary methods. The pus from whatever sounce should be obtained in as pure a condition as possible free from contamination with foreign microbes.

(1) Mc Farland's "Pathogenic Bacteria" p. 269.

(2) Ibid.

(3) Muir and Ritchie's "Bacteriology" p.84.

The neighbourhood of the urethral orifice, especially in the case of the female, should first be well cleansed. The urethra is then "milked" that is to say compressed from within outwards. The specimen to be examined, should be taken preferably after the first drop. In the case of the cervix, cleansing is even more necessary, owing to the large number and variety of organisms, which are found in the vaginal secretion. The cervix should be exposed by a suitable speculum and well swabbed . By compression of the uterus and by passing a sterilised platinum loop within the os a portion of the secretion may be obtained. In all cases care should be takem to have the pus free from vaseline or other oily lubricant, used in the examination of the patient. The film in what ever way prepared must be allowed to dry and then fixed by passing it three times through a smokeless flame. The exact rate may be taken as the slowest with which the finger could pass through without burning. This coagulates the albuminous fluid and thus fixes the particles which it contains. Over heating may alter the characters of the organism to be examined. Other methods of fixing I have found to give good results, but in most cases they are more tedious and unnecessary for ordinary clinical purposes. After drying the film may remain for five to ten min. in a 10% alcholic solution of formalin or by the method of Gulland (1) in which the wet film is immersed in a mixture of alcohol

(1) Muir and Richie p. 86.

ether and an alcoholic sol: of corrosive sublimate . The gonococcus is readly stained by any of the aniline dyes, preferably in watery solutions. It is more readily stained by some of them than most other organisms, with which it is frequently associated. I shall only describe those stains or those combinations of stains which I have found most effectual in producing the desired results . For purposes of demonstration I give the first place to;

Fuchsin - A watery solution 1 in 10 will stain the organism deeply in one minute. It stains also all the nuclei and the bodies of epithelial cells well. The film must be very thoroughly washed in water. As watery solutions do not keep, (slide No 1)

Carbol Fuchsin - (Al. Sol. Fuschin 1 part 5% Carbolic Sol. 10 parts) may be found in practice more convenient. Here the mordant increases the rapidity of the staining, a half minute will be found sufficient. In both methods the film is apt to be overstained and it is therefore frequently advisable to pour over the film for a few seconds some weak decolouriser such as absolute alchhol or a 1 % Sol of acetic acid.

Loeffler's Methylene Blue.- Sat. Alc. Sol. methylene blue 30 cc, Sol. Pot. Hyd. 1 in 10000, 100 cc. This stain is much slower than the former requiring five minutes or longer but it possesses several advantages. The cocci are clearly seen a deep blue and often appear to be somewhat larger than by other methods. The nuclei are also blue but the bodies of the cells are

either not stained at all or only very faintly. The tissue elements are not overstained and films therefore do not require decolourising. Simple watry sol. of methyl blue may be used but its staining is still slower and somewhat uncertain. The blue stain lends itself admirably for counter staining.

Eosin and Methyl Blue - Stain film for two min. in alc. sol. or strong watery sol. eosin, wash lightly, then stain with Loeffer's Methyl Blue for five minutes. The Nuclei of the cells being blue the cocci are apt to be obscured. If the eosin be used after the Methyl Blue the nuclai are paler and the cocci are shewn more clearly. Dilute acetic acid applied to the film for three sec. before or after the blue, removes the colour from the nuclai showing the cocci more clearly than by any other method. (Slides Nos 283)

Schütz's Method.(1) - Stain film for five or ten min in Loeffler's Methylene Blue or Kühne's (Sol. Methyl Blue in 5% Carbol Sol.) Wash in water, decolourise for three sec. in 1% acetic acid, and again wash well. Counter-stain with watery sol. of Saffranin for about 20 sec. The blue gonococci are shown up well and the background of salmon coloured nuclei and cells. (Slide No 4)

Carbol Thionin - Sat. Alc. Sol Thionin 1 part 2½% Carbolin Sol. 10 parts. This stains rapidly and does not overstain. The Nuclei are blue and the cocci purplish blue. Gulland recommends the following combinations which sometimes helps to distinguish the gonococci. (Slide No 5)

(1) Munchem Med Wochenschrift 36 - No 14. 1889

Sol. A. Sat. Sol. Thionin in two per cent Carbolin Sol.
Sol. B. Sat. Sol. of Fuchsin in 2% Carbolin Sol.
Mix 1 of A. with four of B. and stain for not more than half a minute. Gonococci are a deep purple and other microbes red. I find it generally necessary in order to obtain the desired contrast to add more Thionin. The result is an exceedingly brilliant picture and the details well defined. I have however not been convinced of the advantage of the stain over Fuchsin, for the results which are somewhat uncertain, render the distinction of the gonnocácci so slight as to be of little practical value. For puposes of diagnosis rather than of demonstration,

Gram's Method is invaluable. - Gonococci are readily decolourised by it. That it to say, the dye, mordant and Gram's Solution do not form that insoluble compound with the mycoprotein of the gonococcus, which they do with that of many other Bacteria. The many modifications of Gram's method I need not describe here. Having given most of them a fair trial I find the modification of Muir and Ritchie to be the simplest and most convenient in Clinical work and probably the most satisfactory in its results. They substitute 5% Carbol Sol. for the Anilin water of Ehrlich's Sol. This does not cause so frequent a precipitation of the stain and the Bacteria more firmly retain the dye during decolourisation. To 10 parts of Carbolic Sol. or Anilin water add 1 part saturated Alc. Sol.Gent. voilet and filter thoroughly. The film should ~~be~~ remain in five min. at least or the

process may be hastened by gentle heat. Wash in water and transfer to Gram's Sol. (Iodine 1 Pot. Iod. 2. Water 300 parts) for 2 to 3 min.. Wash in water then decolourise in abs. alc. till the film ceases to lose colour this requires 2 to 3 min. Counterstain in a watery sol. Saffranin or Vesuvin. It will be found that the Gonococci are stained red while other cocci are violet. The film may be mounted in water before placing it in Gram's sol. to observe the position and number of the Gonococci before they are decolourised. This is as a rule quite unnecessary. This behaviour of the Gonococcus was first observed by Roux (1) and renders the test of the greatest diagnostic value, for diplococci which do not decolourise must not be regarded as ~~the~~ Gonococci. A diplococcus resembling in form and possessing the Gram-Roux reaction has however been found in the healthy urethra by Lustgarten and Mannaberg.(2) I have frequently observed such a diplococcus resempling exactly the Gonococcus but not decolourised by Gram's method (See slide No.) Further I have isolated such a diplococcus by culture showing a slightly larger size and staining well by Gram's method. This is probably the diplococcus urethrae communis of Foulerton (3) These two varieties of diplococci (or Pseudogonococci) are likely to lead to error only in a very small proportion of the cases. They are larger than gonococci and not usually found within cells. It may be that under certain circumstances these Pseudogonococci take on virulent action with the production of Typical Gonorrhoea. Straus goes so far

(1) Annals des mal. des Org. Gen. Uran. 1887 p.86
(2) Vierteljahresschrift fur Derm. und Syph 1887
(3) Transactions Inst. Prevent. Med. 1897

as to propose that the gonococcus is a normal inmate of the urethra and that under the influence of irration it may become pathogenic (1). Taylor is convinced that a man, under certain circumstances, can get a severe gonorrhoea after connection with a woman, who has never had the disease.(2) Ricord(3) maintains that women frequently give gonorrhoea without having it themselves. Fournier (4) observes that the man gives himself gonorrhoea, more frequently than he receives it. Having therefore considered the possible fallacies, in the examination of the suspected pus, I shall next describe the microscopical appearances of the stained film. The film should be mounted on a clean slide with a drop of water or if for permanent preservation in Canada Balsam disolved in Xylol. If from a case of acute gonorrhoea with abundant yellowish pus, there will be no difficulty in finding the gonococcus almost in every field of the microscope. Diplococci of the definite form already described are to be searched for on the surface or in the substance of pus and epithelial cells. They are most frequently arrangedin groups within the cells. This grouping and their relation to the cells are the most characteristic features to be observed. Their number within pus cells varies considerably. They may appear to completely fill the cell body and obscuring the nucleus. They do not usually invade the nucleus itself. On the other hand only a very few may be found in the cell. Groups are also found outside cells probably the results of the bursting of the envelope of the cell. Isolated gonococci may also be

(1) Archiv. de Med. Expir et d'Anatomie path 1889, 1.
(2) Taylor's Venereal diseases p. 101.
(3) Lettres sur la Syphilis 3rd edition p. 46.
(4) Nouv. dict. de Med. et Chir. pratiq. 5 p.152.

found but rarely. If this character of the gonococcus be absent the diagnosis must be negatived Foulerton considers that there should be at least four pairs in each pus cell to render the diagnosis certain. I have frequently observed in pus preparations a clear unstained portion or capsule around the cocci though the existence of a capsule has been denied. In the case of epithelial cells they seemto stickto their surface rather than penetrate their substance. The number of epithelial cells as compared with pus cells are few is small 1 in about 50. When the decease is subsiding the epithelial cells become increased in number and the pus cells correspondingly diminish and still more so are the gonococci. The use of the microscope in determining the stage of the disease will be described later. If care be taken to prevent contamination of the pus very few and in many cases no other bacteria will be found in the film. This is especially so in pus from early urethritis in the male. In the later stages of gonorrhoea in the female genital tract numerotherous other microbes may be found. Staphylococci streptococci bacilli coli and other species of bacteria will be readily recognised. These as a rule except the bacillus coli stain by Gram's method and in a successful specimen gonococci stand out in marked contrast. As the finding of the gonococci inthe acute stage is easy so it is difficult in the chronic stages. In pus taken from any portion of the female genital tract other than the urethra the detection of the se cocci is attended with the greatest difficulty. I have frequently found that in

cases of undoubted vaginitis, with characteristic discharge very few gonococci or none at all could be found. Some of these cases were associated with a gonorrhoeal urethritis. I refer to cases of true vaginitis, with redness and tenderness of the mucous membrane, not to a condition in which the vagina is full of pus, which is of cervical origin. It is believed that the gonococcus cannot grow on squamous epithelium and therefore it will rarely produce a vaginitis in the adult. My clinical experience bears out this fact. I have examined a large number of prostitutes, most of whom were suffering or had suffered from gonorrhoea, of some portion of the genital tract. Almost all of them shewed purulent discharge from the vagina. Very rarely have I found any gonococci in it, even in those cases in which the discharge was of cervical origin. There can be no doubt that when there is a purulent urethritis the vagina becomes inocculated with gonococci. They find no suitable nidus for their growth and very soon die. It is possible that the combined toxines produced by the bacteria in the vagina, themselves inhibit the growth of the gonococci. The vagina bacillus which is often present in large numbers in vaginal discharge has been shown to be antagonistic to the life of other organisms. Döderlein (1) who has investigated the subject largely has shown that the bacillus produces lactic acid which not only inhibits the pathogenic power of other organisms but, in many cases destroys them entirely. Even the gonococcus though very resistent very quickly disappears in its presence. This fact was well

(1) Reed's Gynecology p.164.

demonstrated to me in a case, in which the patient suffered from urethritis, the pus of which contained numerous gonococci. She also had purulent vaginitis and after repeated examinations I could find no gonococci except in the instance mentioned below. The slides were however crowded with bacilli almost in pure culture. (Slide No. 7) illustrates this well and although one group of gonococci is to be found their presence is probably accidental. The bacilli seemed to prove that they are either the cause of the vaginitis or that their multiplication is anti-gonococcal. These bacilli stain well by Gram's method and are readily distinguished from the bacillus coli communis. It may be that gomococci undergo some metamorphosis in the vagina which renders them impossible of recognition, but when inoculated into the urethra during coitus they regain their lost virulence and form. Although infection takes place by direct contact with urethra or cervix I believe that the purulent secretions in the vagina are often infectious. Such theories may not unnaturally be surmised after the statements made by Ricord and Fournier already quoted. Bumm however believe s that a secretion, in which gonococci cannot be found, is not infections. There is no proof however that gonococci were not once there but now have become so altered by their life in vaginal secretion or in the many glands and diverticula of the genital tract that they cannot now be recognised. This idea was suggested to me by Prof. Straus's theory of acquired virulence. There is therefore some difficulty in determining the virulence of a vaginitis as regards the gonorrhoeal virus. it is no

easy task to detect gonococci in discharges from the uterus, but after careful search they may be found even in the glassy plug of mucus which occupies the cervix in chronic cases. A sterile platinum loop or small curette should be passes with in the os and some secretion obtained. In both male and female the urine should be examined for threads and in their absence the deposit obtained by the centrifuge. Threads should be spread out on the slide fixed and stained lightly. It is an advantage to treat them with a little dilute ascetic acid before staining the result being an increased transparency of the thread. Methyl blue or thionin are the best staims. Gonococci should be sought in the pus cells along the edges of the thread. From whatever source the material for examination is obtained it is necessary to make several films. I invariably stain one with fuchsin, one with methyl blue, and one by Gram's method. In most cases there can be no doubt of the part played by Neisser's gonococcus. It will however often be necessary to carry out a further and more certaintest. This consists in the study of the organism grown on artificial media.

Cultivation

This will be necessary in all cases where the microscopic characters are indefinite, or the cocci difficult to find, suchas in remote complications of the disease. Perhaps its greatest necessity is in social and mediao-legal cases, for by this method the proof of identification is absolute. The gonococcus is one of the most difficult pthogenic microbes to cultivate on artificial media. It was first

grown by Bumm in 1885 (1) on human blood serum. It is the experience of all bacteriologists that blood serum treated in some way or other is the only medium on which the organism will grow satisfactorily. Many have grown it since on various mediabut all have admitted its difficulty and uncertainty. My experience of it has been limited to what is possible in a small laboratory constructed for the requirements of a small General Hospital.* My object therefore has been to study the methods, by which the practitioner equipped with an incubator and suitable media can verify his diagnosis by culture expiriments. From his point of view my results have been somewhat dissapointing for its great uncertainty robs it of much of its practical value. I have inocculated on suitable media pus which miscroscopically appeared full of the cocci in almost pure cultures. In many instances I have been successful but in quite as many I obtained no growth of gonococci but other pyogenic colonies in abundance. One cause of the difficulty is in recognising the colonies. These are so small and often nearly invisible, as to render them easily missed especially among colonies of other species. The staphylococcus pyogenes aureus is the one which I find most frequent. next the albus and then the bacillus coli. Straptococci are rarely found. Having obtained cultures of gonococci it is even more difficult to maintain their vitality during the process of making subcultures. It is probable that as has been shown the growth has taken place in the medium of its own pus and therefore as Fullerton insists, the cocci whentransferred must be free from pus before comcluding that the medium, on which the

(1) Sternberg's Bacteriology p. 297.

* This laboratory was instituted by me & the incubator constructed by my directions.

subculture grows, is a suitable one (1). This no doubt explains the frequent failures to obtain pure subcultures. Of the various methods which have been recommended, there is only one which is practicable for the clinician. It is the method of Abel and is strongly recommended by Foulerton (2). Nutraint agar(2%) is used either sloped in tubes or better still poured into Petri dishes. One or two drops of blood, obtained from the finger or ear, under strict aseptic precautions, is transferred by a sterilised platinum loop to the surface of the agar. A very small quantity of the pus, free from foreign contamination, is then mixed with the blood and smeared, stroked or dotted over the agar. A sterilised camels hair brush will spread this more smoothly over the plate. The platinum loop may be used to inocculate a second or third blood-agar plate or tube without recharging. In this way the colonies will be fewer and more isolated. Growth occurs best at an incubating temperature of 37° c. Not at all above 40° nor below 25° c. In from 18 to 48 hrs. (if successful) colonies of gonococc i will appear. They are at this stage very difficult to recognise, and the plate or tube must be examined with great care or the colonies will be washed away by the water of condensation They are described as being like dew-drops and they certainly do have that appearance, especially when viewed by semi-transmitted light. They are very minute rounded points nearly transparrent and with a yellowish white tinge. If the plate be inverted and examined under the low power of the microscope they will be seen to be round and finely granular.

(1) Curtis's Essentials of Bacteriology p.123. (2) Ibid.

In two days they are decidedly larger, but thin generally except in the centre, which now begins to thicken. On the third day they may obtain their maximum size and are of a thin wax-like appearance. The edge now becomes irregular and microscopically will be found to have a thin veil like extension gradually fading away, the certre being thick and of a decidedly brown colour. By this time they have attained the size of one to two mm. in diameter, but sometimes will continue to grow until the fifth or sixth day, and are dead by the ninth or before. The method which is considered the best is that devised by Wertheim (1) but I have only once been able to adopt it owingto the difficulty in obtaining human blood serum sterile. Once I got enough blood during the performance of a surgical operation and having separated the serum, I was successful in obtaining growths. A test tube containing the liquid and sterile serum is inocculated with the pus, and then mixed with equal parts liquified agar at 40° c. The mixture is then rapidly shaken and pourdd into a Petri dish. This method although the best is not practicable for the reasons above stated. I have had more experience with ascitic fluid obtained from a case of cirrhosis of the liver. It is used in the same way or inthe proportion of ascitic fluid 1 pt. agar 2 pts. The medium does not appear to be a very suitable onefor though colonies have generally been developed they donot obtain their maximum size and the cocci very soon degenerate and die. Colonies in the substance of the medium appear when magnified to be minute spheres which

(1) Muir and Richie p.

later become somewhat irregular and yellowish white in colour. The gonococcus may also with difficulty be grown on the serum of animals. Many other media have been found suitable, such as pleuritic effusion, acid or albuminous urine agar albumin &c. (Sternberg) but they are not trustworthy. Growth will not take place on ordinary agar gelatine or potato. A small portion of the growth should be examined by the "hanging drop" method and as a film. In the drop the double form will be recognised and though they possess Browniam movement they have no independent motility. In one corner of the film I generally place some culture of staphylococci and then stain by Gram's method and counterstain with saffranin or fuchsin. (Slide 8) The cocci are thus distinguished by the form and staining the actions. One of the most characteristic features of the cultivated organisms is the rapidity with which they degenerate. In two or three days they lose their biscuit shape, become swollen and stain feebly especially if the medium be not a very suitable one. Slide No 9 taken from a colony on the third day grown on ascitic fluid and agar shows this well. The same slide also shows diplococci, frequently found in urethra, from which gonococci must be distinguished. Healthy gonococci are similar in appearance to those in pus cells except that they are smaller and the slit rarely so wide.

Its distribution in the tissues

This may be considered in two groups;

1. Local Infection.

A purulent catarrhal inflammation known as Gonorrhoea or 'Blenorrhoea' of foreign authors.

2. General Infection.

Remote inflammatory processes the result of the entry into the blood of gonococci themselves.

1. Local Infection

In mucous membranes -- Those of the genital tracts, conjunctiva, rectum, mouth and nose are the seats of primary gonococcial infection. As gonorrhoea rarely causes death and the tissues affected are not those which may be removed for microscopic examination, the pathogenesis of the organism is not easily studied. My information therefore is obtained chiefly from the studies of Bumm and others. The gonococcus having been implanted on a mucous membrance, (e.g. the urethra) begins to multiply on its surface. They very soon penetrate between the cells where they greatly increase in numbers. A superficial breach of epithelium does not seem to be necessary for their entrance. Before they penetrate at all deeply they produce such irritation, probably through the agency of their toxines, as to cause swelling of the epithelial cells and slight increase in the sero-mucoid secretion. It is not however until they have penetrated into the deepest epithelial layers, thay the inflamatory reaction is at all severe. The most marked change is the intense white celled infiltration, which occurs in the submucous layer and amongst

which gonococci can be found. With the onset of this inflammatory reaction, the epitherial cells begin to desquammate. The leucocuites by their migration to the surface hasten this desquammation, but it very soon ceases as the exudation becomes purulent. In the very early stages therefore the discharge will be found to contain a large number of epiterial cells with cocci attached to their surface and penetrating their substance. According to Weichselbaum this penetration does not occur until after the cell has been shed(1). The entry of the gonococci into the leucocyte is however probably due to the phagocytic action of the latter. If that is so, it is remarkable that the cocci do not appear in any way to lose their vitality by being so transposed, for they seem to multiply in the cell, even to the extent of rupturing its envelope and escaping. Certainly their most typical form is to be seen when within the cell. During the early stage of the attack many cocci may be seen lying free, but in the fully developed purulent stage they were almost entirely confined within pus cells . After a time varying between days and weeks a process of repair sets in the parts denuded of epithelium become covered over by cells more definitely squamous in shape and derived from the subjacent cylindrical cells. These squamous cells are very resistent to gonococci and their presence in the discharge is an indication of repair being in progress. They not only favour the subsidence of the inflammatory reaction but act as a barrier to the exit of leucocyts and exudation. At this stage therefore the pus will be

(1) Waichselbaum Path. Histology p.123.

diminished in quantity. Pus cells and cocci fewer and epithelial cells proportionately increased. These epithelial cells it must be noted are of the squamous or pavement type and quite unlike the exfoliated cylindrical cells of the early stages. These cells however are rarely seen as they are discharged within a day or two of inflammatory onset. Also during the subsiding stage the cocci are not so frequently found. Groups are numerous outside the cells a point of much importance in diagnosis. The inflammatory process is at first limited to the area of implantation, but may soon spread along the surface of the mucous membrane. Infection of the submucous lymphatics are alo responsible for its ppread. Probably the invasion is rendered posible (in a susceptable individual) by the paralysing effect of the toxins on the leucocytes, thereby inducing phagocytosis. The lymphatic invasion is in some cases so severe as to produce definite signs of lymphangitis and lymphademitis. The cells lining the acini and ducts of the many urethral glans are especially prone to gonococcal invasion. Buried in this region the cocci tend to remain for indefinite periods . They cause such alteration in the luman of the duct, as to interfere with the ready flow of execretion. This induces an inspissation of its contents which may be discharged by ~~the~~ mechanical ~~chemical~~ means in the form of a urethral thread. A thread when examined will be found therefore to be a cast of the duct, formed by the inspissated products of the glands namely, pus and epithelial cells and gonococci embedded in mucus and fibrin. The examination ofthese threads is of the greatest diagnostic importance, for they are often the only evidence of

the persistence of gonococci in the urethra. After the disease has been well established, secondary infection of other pyogenic bacteria occurs and these play an important rôle, in the further progress of the disease, and are the direct cause of many of the complications. They are more readily found in the female urethra than in the male, and a plentiful growth is obtained when the pus is inocculated onto the culture medium. In such complications as phimosis, periurethritis and bubo they are probably the exciting causes of the suppuration. The gonococcus however seems to have prepared the way for separate infection through epithelial erosions or glandular obstructions. Bumm (1) believes that pure gonorrheal inflammation is confinedto mucous membrane, and that the pyogenic organism produce the various complications arising in connective tissue. Werthim however has shown that gonococci do invade connective tissue and is the causeof the inflammatory arounf the uterus and ovaries in gonorrhoea. Even along mucous membranes the gonococcus seems to favour the transit of other bacteria for in a few cases of gonorrhoeal pyosalpinx pyogenic organisms have been found. In other cases of this disease, gonococci only are found and not infrequently the pus is sterile. The sterility of the pus may be due to auto-intoxication of the gonococci. That the gonococcus is directly responsible for gonorrhoeal epidydimitis is the uniform opinion of all. I can however find no record of the discovery of the organism in the epididymis or its adnexa. The old theory of sympathetic inflammation is entirely replaced by that of ~~distention~~ infection by direct continuity

(1). Deuche Med. Wochemshrift - December 8th 1887.

along the ejaculatory duct and vas deferens. The other regions which are affected by local infection will be considered later.

Gonorrhoeal Toxaemia

The toxines produced by the gonococcus have not yet been isolated. When absorbed into the system, they produce a toxaemia, the severity of which, may be so mild as to produce no symptoms, or so severe tas to cause death. A case of such profound toxaemia, passing into a typhoid state, and resulting death, has beenrecorded by Osler(1). With the onset of blenorrhoea, there is frequently definite febrile reaction, with its accompanying symptoms. I have noticed in several cases a very definite anaemia, which I think was more severe, than could be accounted ~~by~~ for by the drain of albuminous material in the discharge.

General Infection

That the organism itself may be distributed throughout the body by the bloodstream is now beyond doubt. Welch(2) has found gonococci in the blood before death in a case of gonorrhoeal pyaemia ~~which have been~~ . In some of the few cases of gonorrhoeal pyaemia which have been recorded, staphylococci have also been found. Much more frequently gonococci excite an inflammatory process in the synovial membrane of joints, the exudation of which rarely passes on to suppuration. Similarly it attacks bursae fibrous tissue especially the ligaments of joints fasciae and tendons. Cases of pericarditis, endocarditis and spinal meninpitis, from this course have also been recorded (3) . All these conditions are grouped together under gonorrhoeal rheumatism. In the

(1) Osler Practice of Medicine 3rd Ed. p. 256.
(2) Medical Record June 15th 1895
(3) Taylor Venereal Diseases Chap. 26 & 27.

fluid of gonorrhoeal synovitis the cocci have been found so frequently by Finger, Neisser and others, but they are believed to be directly and often solely responsible for the inflammation. When the effusion is purulent pyogenic cocci predominate, and are the cause of the suppuration. In two of Finger's cases the associated organism was the streptococcus. Gonococci have also been found in cases of teno-synobtas. It is now quite evident that the field of gonococcal infection is an extremely large one, and the clinnical types which are met with, combine to prove that gonorrhoea is by no means the trivial disease it is considered to be. When we take into consideration its far reaching sequelae, the frequency with which these completely ruin the constitution, gonorrhoea may well compete with syphilis, as being the form of venereal disease to most dreaded.

Gonorrhoea

Aetiology -- Before summarising the aetiological questions some of which have already been discussed, I must define gonorrhoea as ~~it contains~~ 'a specific inflammation which is dependant upon the gonococcus'. Such inflammation generally affects the genito-urinary tract, and the term applies to no other form of inflammation. A purulent urethritis may be set up by other organisms but this non-specific variety, must be carefully distinguished from gonorrhoea. The disease occurs as a result of inocculation during coitus of some portion of the genito-uriary tract and is par excellence the venerial disease, for the following reasons. Accidental infection of that tract is extremely rare, owing partly to the poor vitality of the organism outside the body and with the

exception of the conjunctiva, nose, mouth and rectum, primary inocculation of other tissues pfoduces no result. I therefore summarise the fowwowing conclusions;

1. That gonorrhoea is dependent in all cases on the presence of the gonococcus.

2. Thatgonococal infection occurs in the majority of cases during sexual intercourse.

3. That such infection may be in a few cases accidental.

4. That under such conditions as sexual intercouse and alcoholic excitement, ~~the~~ gonococci may arise de novo from other organisms which are harmless inhabitants of the healthy urethra.

5. That acute gonorrhoea may arise under similar conditions arise from gonococci which in exceptional cases have for a lond period remained inactive in the urethra.

6. That a secretion free from gonococci is not infectious, but if such secretion be from a urethra once the seat of gonorrhoea, gonococci may in some future time appear.

7. That the acute purulent urethritis ~~would~~ which sometimes occurs after coitus but is due to other pyogenic organisms, should not be regarded as gonorrhoea.

Predisposing causes

The following conditions are likely to predispose to gonorrhoeal infection. A penis which is large and long, with a wide meatus, or the condition of hypospadias, is more liable to infection. Conditions which induce a state of hyperaemia increases liability e.g. alcoholic excess masturbation and phimosis .

GONORRHOEA IN THE MALE

Acute Anterior Urethritis

This consists in a gonorrheal inflammation affecting a portion of the whole of the anterior urethra. The anterior urethra extends from the meatus to the anterior triangular ligament, and includes the fossa navicularis, pendulous urethra and the bulb. The inflammatory process may become most severe in any of these regions, but it starts probably in all cases in the fossa navicularis, in which the infective pus is at first implanted.

Incubation. -- this varies from one day to three weeks but in the great majority of cases the period lasts from 2 to5 days. These figures taken from the statistics of Finger are similar to those of Taylor (1) who finds however that his greatest number of cases had an incubation period of 7 days. Conditions which induce hyperaemia of the urethral mucus membrane, or unusually virulend pus, tend to shorten the incubation period.

Symptoms -- Prodromal Stage -- Symptoms here begin at the termination of the stage of incubation. These may be slight as not to be noticed by the Patient. According to White and Martyn there is often a marked concentration of the mind on the penis and a tendency to frequent inspection. I should think this might be explained in many cases by the sense of venereal dread. Sensations of heat, itching or tickling of the meatus or glans and a slight gluing of the

(1) Venereal diseases p. 108.

lips during intervals of urination are frequent. This gluing is due to a scanty secretion of sticky mucus, which if examined will show gonococci free or more frequently attached to epithelial cells, which tend according to Taylor to retain their columnar shape. This slight irritation often produces marked sexual excitement. In a day or so decided redness of the meatus may be seen, with increaced mucus secretion and slight ardor urinae. Very rapidly now the secretion becomes purulent and the inflammatory signs increased.

The Acute Stage. -- The purulent discharge so characteristic of this stage may be the first symptom to attract the patient's attention In a well marked case there is redness, swelling and pouting of the meatus, often sufficient to cause diminution of the stream of urine. The glans is similarly included in the inflammatory process and the prepuce may be so swollen and oedematous, as to induce phimosis or paraphimosis. The discharge is now profuse, thick, of the consistence of cream and of a greenish yellow colour. It is frequently mixed with blood. Microscopically it consists of a large number of pus cells but very few epithelial cells. Gonococci are numerous occuring in groups chiefly within the cells. The amount of discharge varies with the virulence and extent of the inflammatory process and increases until the disease has reached its height which occurs generally during the second week or before. By this time the greater part of the anterior urethra has become involved, and feels swollen and cordlike, owing to turgescence of the corpus spongiosum. Pain and scalding on urination now

becomes great and the stream, which may already have become smaller, becomes moreso and aften twisted and irregular. This dysuria is generally the most distressing feature of the disease, and the pain is felt along the penis or referred to its point. When the anterior urethra alone is involved, there is not usually increased frequency of micturition, but the ardor urinae may induce spasm of the compressor urethrae and retention of urine even at this stage. When the disease has spread to the bulb the pain becomes increased and may be referred to the perineum, groin, hypogastrium and small of the back.

Chordee -- A condition, which, owing to its frequency, should be regarded as a symptom rather than a complication, is common at this stage but mild forms occur earlier. The corpus spongiosum which is then in a condition of inflammatory oedema, is unable to stretch along with the corpus cavernosum during the erection. Erections occur more frequently than normal and cause intense pain, by pulling and by pressure on the engorged corpus spongiosum. This also explains how the penis is in most cases bent downwards or laterally, when inflammatory infiltration in one half of the corpus cavernosum prevents easy distention. Painful erections without necessarily the bend of chordee are present in varing degrees in most cases but according to Taylor they are often induced by the two early use of strong injections and the internal use of balsams and alcohol. Like Chordee, it usually comes on during the night the warmth of the bed seems to encourage it, for patients often find great relief in getting out of bed and exposing themselves to a draft of cold air. They find this more effectual than the warm baths and hot fomentations generally prescribed. It is in this condition that

rupture of the urethra and fracture of the penis occurs from violence.

The urine -- should always be examined in two portions By the "two glass test" the first portion shows marked turbidity. and a varying amount of pus and mucus will be deposited. The second portion will be clear. As the acute stage subsides, the pus becomes diminished in amount, and suspended in the mucous are seen small white masses and urethral threads mucus and cellular.

General symptoms are often marked -- a slight amount of fever with malise and mental depression are fairly constant.

Stage of decline -- After persisting for about a fortnight the severity of the symptoms become gradually diminished, discharge less in quantity, thiner and milky in appearance. Pus cells and gonococci are fewer but the flattened epithelial cells more numerous. The ardor urinae and painful erections disappear and in most cases all symptoms will have gone by the end of 5 or 6 weeks. Either stage may be prolonged considerably as a result of neglect, in-appropriate treatment or possibly the constitutional enfeblement of tubercle, syphili s &c. It is however the stage of decline which is apt to persist and in it relapses, like an acute stage, are frequent. These relapses are dependent of localisation of the inflammatory process to certain susceptable areas such as the fossa navicularis, peno-scrotal angle, the bulb and especially the mocous follicles. Sexual excitementand alcoholic excess are very likely causes of renewed activity of the gonococcus, in these regions. Anterior urethritis may persist for months without involvement of the posterior

urethra, but in a large majority of the cases it becomes affected. Finger believes that this occurs in 70 to 80 of all cases.

Acute Posterior Urethritis

Gonorrhoeal inflammation of this portion of the urethra is of the greatest importance, for its involvement preceeds many of the most important complications of the disease. The term includes inflammation of the membranous and prostatic urethrae, situated between the anterior layer of the triangular ligament and the orifice of the bladder. It is involved generally in the 2nd week but the symptoms are apt to be overlooked. When the patient begins to complain of deep seated pain inthe perineum, with frequent micturition it is probably involved. The pain is often felt at the end of the act and may be referred to the glans penis. When severe it is due to muscular spasm and is accompanied by straining. It may raidiate to the groin hypogastrium and back. The frequency of micturition may be slight or so severe as to constitute "relative incontinence". The desire in these cases in uncontrollable, owing to the contact of a drop of urine with the hypersensitive urethra. In this condition also retention of urine is not uncommon owing to reflex spasm of the sphincters. Haematuria from rupture of the congested urethral vessels also occurs, and generally at the end of the act, when the posterior urethra is compressed, or it may form a cast and pass first. It may also flow back into the bladder and become mixed with the urine there. In some cases albumen is found and the urine in ecxess of that whichthe pus contains. The discharge produced in

the posterior urethra is retained by the action of the compressor urethrae muscle, therefore there will be no increase of the pus at the meatus. On the contrary the discharge is often diminished. If it is not at all profuse it will flow back into the bladder and by the "two glass test" the second portion of the urine will be cloudy. If the pus is scanty, it will pass out in the first portion along with that from the anterior urethra. By flushing out the anterior urethra and then causing the patient to pass water in two portions the first will be turbid with discharge from the posterior urethra and the second clear. Examination of the urine in this way is a very sure means of localising the inflammatory process. The acute stage may last several weeks and then subside slowly with amelioration of all symptoms. It is at this stage that urethral ~~stage~~ threads are so frequent. These threads are however no aid in determining microscopically the seat of the disease. The prostate, seminal vesicles, and bladder are apt to become affected by the spread of the gonorrhoeal inflammation from the portion of the urethra. A slight involvement of the prostate is so constant, that it may account for many of the symptoms.

Treatment of Acute Urethritis

There are few diseases, which have taxed so largely the recourses of the therapist. There are many methods and many remedies adopted each having its enthusiastic supporters. The unbiassed explorer will therefore probably find that no one method or remedy would give the results expected. It will be impossible for me here to describe all these methods, but I will indicate what I believe to be the principles of

the treatment and such methods as I have been able to adopt. The great difficulty lies in the fact, that the remedy required must destroy or inhibit the local action of the gonococci, without itself devitalising the tissues to which it is applied. In short the object is to find a perfect antiseptic, which may be applied to the urethra. This principle appears to me, to be the only rational one, when the pathology of the disease is so clear as it has become since Neissen's discovery. Frank (1) truly says "He, ~~also~~ who does "not, at the present day, after having made the diagnosis, begin "prompt and energetic treatment directed against the gogonocci, "commits a grave and in no wise unpardonable sin of omission "towards his patient" The older palliative treatment will however continue to hold its own until such efficiency of anticeptics is discovered. In our present knowledge success will depend on a combination of the two. Should the case be seen in the earlier stages - that of the prodromate - the wisdom of attempting to abort the disease is generally accepted. Rarely has one the opportunity. During the acute stage the objects are;

1. To relieve local congestion.
2. To render the urine unirritating and antiseptic.
3. To use such antiseptics locally as are suited to the inflamed state of the urethra.

When practicable the patient should be in bed until there is a decided amelioration of the symptoms. This is the rule in all government institutions and the results render it justificable. In other cases a suspensory bandage should be worn and active exercise avoided. An absorbent dressing

(1) Medizin der Gegenwart Bd. 1. No. 1

is most important and the practice so common of putting cotton wool over the meatus is not a good one, for it cannot properly absorb so thick a discharge and this is often proved by the escape of pus from the meatus after the removal of the wool. Gauze or linen is more effectual. Through a hole in its centre the glans may be passed and the foreskin then drawn over it. As early as possible a brisk purge should be given and the bowels kept open subsequently. The diet should be light and plain and for the first days, milk, which in addition to other advantages encourages free diuresis. Highly seasoned foods, alcohol, coffee and other strong beverages, must be avoided, but barley water and alkaline mineral waters freely given. These aid the flushing of the urethra. Internally great relief is aforded by the "alkaline treatment" by diminishing the ascidity of the urine and rendering it less irritating. Potassium Bicarbonate grs. 20 combined Tinct Hyoscyamus m. 30 makes a most welcome remedy, especially when the ardor urinae and frequency of micturition are marked. After the disease has reached its height, one of the many urinary anticeptics or "anti-blenorrhagics" as they are called should be tried. Unfortunately their action on is most uncertain or at the best mild. The Balsams of Copaiba and cubebs and the Oil of sandal wood have been looked upon as specifics, but in common with most observers, I find that they are sometimes valuable, but not to berelied upon. In addition to their antiseptic action, they are stimulating to the urethral mucouc membrane and therefore more suited to the later stages and are often harmful when given early. Their utility is further limited by the fact that they do

readily interfere with digestion. Of these Santal wood oil is the best. Salol, urotropine and boric acid are antiseptic but too mild to be effective. The first two I have tried frequently, but I have found no decided benefit excepting in those cases which were complicated with cystitis.

Locally -- When the penis is swollen and inflammed, cold evaporating or lead and opium lotions, often give great relief. In these cases especially when there is much ardor urinae hot fomentations or emersion of the penis in hot water are better. As soon as the urethra becomes tolerant injections or irrigations should be commenced. The medical treatment used during the acute stage should have antisepsis for its main action. Its power of penetration should not be prevented by its own chemical action on the tissues. Its strength should be such that while it retains its bactericidal power it is unirritating, and not destructive to the epithelial cells. The drug which most nearly fulfills these requirements is Protargol. It was discovered in 1896 by Eichengrün, and has since been extensively used and strogly advocated by Neisser, Finger, Strauss andothers. It should be used in gradually increasing strength, in solutions of a half to two per cent as an injection or irrigation. The following case will illustrate the rapidity with which it sometimes acts. A man was admitted late one night to the Royal Albert Hospital, for an irreducible paraphimosis associated with a freely discharging gonorrhoea. Under chloroform the constriction was divided and circumcision performed. He had had a discharge for above a month, and was using regularly injections of potassium permanganate but

without much benefit. He suffered from ardor unirae but not severely andthere was slight increased frequency of micturition and a degree of turbidity of the second urine. The posterior urethra was no doubt affected. The discharge contained numerous gonococci. The next moring I commenced irrigation with a pint of a ½% sol of protargol. The reservoir was raised about 4 feetabove the urethra and to the end of the tube was attached a small catheter with a reversible stream. This was passed at first as far as the ~~bowels~~ bulb and the anterior urethra well flushed. It was then passed on until gripped by the compressor urethrae . Much of the injection passed into the bladder which soon became filled and was immediately expelled. The treatment caused the patient no discomfort, and was repeated twice daily. On the third day the discharge was serous, and that only present in the morning, and on the fifth day he left the Hospital with no discharge and only a slight morning gumminess of the meatus. He also took santal oil M 15. thrice daily. I ordered the continuance of the medicine and simple injections of 1% protargol for a week. At the end of that time I saw him and he was without a sign of the disease. This method of irrigation which may also be employed with a soft catheter, or simply a nozzle applied to the meatus (Janet's Method) will be found effectual in the majority of cases. The patient can be taught to use it himself. When the anterior urethra alone is involved, the catheter is not passed beyond the bulb, but the escape of fluid into the bladder seems to cause no infection of either it or the posterior urethra it being promptly expelled. It closely imitates natures method of cleansing the urethra. It is

especially useful in posterior urethritis. It should not cause pain andif the urethra be too sensitive I prefer to abandon the catheter, rather than render the urethra insensitive by cocaine. The frequency of irrigation and its continuance must depend on its effect on the disease and on the sensations of the patient. Instead of protargol the following may be used in suitable strength; Silver Nitrate, Bicloride of Mercury, Mercural, Permanganate of Potassium or Zinc. Injections with the ordinary urethral syringe is the more usual form but is not mearly so effective. Of the numdrous injections, it is difficult to say which is the best. In a limited number of pages one is not able to make a comparative or exhaustive study of each. Salts of Silver are generally recongised to be the best. It is not a perfect antiseptic but it favours the absorption of inflammatory exuadtion. Whatever be the injection used, it must not be continued too long, for its irritation will keep up a slight but constant discharge. Such a discharge is often kept up by superficial erosions, and is not dependent on the gonococcus therefore, astringent injections for a short time should be used. In the acute stages of the involvement of a posterior urethra, all injections and irrigations should be stopped for a time, the general antiphlogistic measures being pursued with caution. In its declining stage irrigations should be resumed with the special object of applying the medicant to the posterior urethra.

Iodoform and Eucalyptus bougies passed into the urethra in the early stages are recommended by ~~watch and chain~~ Watson Cheyne and I haveseen good results from them. Lastly Ointments may be

applied on cupped sounds as recommended by Unna.

Ardor Urinae is best prevented by alkalies and hyoscyamus internally. In severe cases the injection of 4% sol. of cocaine before urination.

Chordee -- may beprevented by hot baths at bedtime with ldr. potass. bromide and 20 grains chloral hydrate. Should that fail opium and belladonna suppository or better still morphia quarter grain given hypodermically into the perineum. In all cases patients should rise during the night to make water (1).

CHRONIC URETHRITIS - GLEET

~~Chordee~~ - In this condition the persistence of a slight discharge of muco-pus for months. The discharge, which may be so slight as to produce only a gumminess of the meatus in the morning, is usually dependent on localised inflammatory foci in some portion of the urethra. Chronic inflammation of the crypts of Morgagni or the glands of Littré and Cowper will often keep up such a discharge. In most cases however, it comes from areas of congestion, erosion, or granular thickening of the mucous membrane. These changes are due to the deep penetration of the gonococci, causing epithelial proliferation and chronic exudation into the sub-mucous connective tissue. Unless properly treated the exudation becomes organised and by its contraction results in stricture. These areas known as "granular patches" may be seen by the endoscope. Endoscopy should never be practised before the chronic stage of a urethritis and except in the hands of experts it may do considerable harm. Diseased areas are most commonly found in the anterior

(1) Hare's Practical Therapeutics p. 548

urethra especially in the bulbous portion, but they are also found in the posterior urethra. In addition to discharge, chromic urethritis may be made manifest by the examination of the urine. Threads are frequently present and by the "two glass tests" their source may be determined. The short comma-shaped threads are believed to come from the prostatic urethra, the long thin threads are generally formed of mucous and cells and are formed within the lumen of the urethra. When the posterior urethra is affected, there is often pain varying in severity, and generally at the end of micturition. Frequency is not usually marked. Disturbed sexual function and seminal emissions are frequent. The infective power of the discharge in gleet is to be determined by the microscope. Gonococci are very few in number and may not be found even after repeated examination. Its absence cannot always be taken as a proof that the discharge is inert.

Treatment -- This is uaually most unsatisfactory and as patients suffering from gleet so rarely apply to the hospital for treatment my experience of it has been very limited. I shall therefore only briefly summarise the methods adopted. Irrigation as already described of the whole urethra sometimes brings about a cure. The medicant used should be in its full strength. This may be preceeded by the occasional passage of a large size cold metal bougie, which mechanically empties the ducts of the glans and favors the absorbtion of the exudation in the inflammed patches. When the posterial urethra is involved the irrigation must always reach that portion of the urethra.

The drug may be applied by the instillator. Of the solutions employed astringents are generally found servicable, but ~~some~~ in bad cases silver nitrate should be used. Applications may be made directly to the diseased areas through the endoscope. Lastly in bad cases ointments are introduced with special instruments as strongly recommended by Finger.

COMPLICATIONS IN MEN

Balanitis, Phimosis and Paraphimosis have already been referred to and are treated surgically.

The same may be said of suppurative inflammations of the urethral glans producing follicular, peri-urethral abcess and Cowperitis.

Bubo - Swelling of the glands in the groin is common in gonorrhoea but suppuration does not occur except in mixed infection. If it does occur during the course of gonorrhoea a soft chancre is either associated with it, or mixed infection has occured through some small abrasion in the mucous membrane of the glans or urethra.

Prostatitis

In many cases of posterior urethritis the prostate becomes involved in from 2 to 6 weeks. It occurs firstly as a simple hyperaemia. The prostate on examination per rectum will be found uniformly swollen and tender and will produce such symptoms as increased weight and pain in the perineum, paid during defaecation and increaced frequency of micturition with pain especially at the end of the act. In ~~severe~~ bad

cases there will be great constitutional disturbance with severe local symptoms. Rigors, fever, shooting and throbing pain, which renders urination, defaecation and examination per rectum almost unbearable, cause the patient to take to his bed. The greatly enlarged prostate usually ends in suppuration and the abcess if not opened bursts into the urethra. It may on the other hand burst into the rectum or ischio-rectal fossa and I have seen a case of extensive burrowing from this cause. Chronic prostitis may result fromthe above, and though its symptoms, which are many, are not severe, they cause some distress to the patient. Prostatorrhoea and sexual debility are usually present.

Treatment -- Inthe early stage consists in the application of heat in the form of hot fomentations, hot sitz baths or hot irrigation of the rectum. Morphia hypodermically or in suppositories are necessary and when suppuration occurs it should be opened by a medium perineal incision.

Vesiculitis

Inflammation of the seminal vesicles in some degree is more grequent than is supposed. It gives rise to similar symptoms to prostatis but the diagnostic sypmtom which is oftem present is Haemospermia or emissions of bloodstained semen. When the vesicle becomes distended by retained semen or pus it may be felt per rectum as a tender fluctuating swelling above the prostate and to one side. The condition may be double. In one case which appeared to me to be a mild form of the disease Ifound per rectum the prostate slightly enlarged and tender and above it an indefinite swelling towards the left side. After compressing it and

massaging the prostate a considerable quantity of spermatic fluid and containing pus cells was expressed and passed after urination. The anterior urethra was first thoroughly flushed. (See slide No) Chronic forms and abcess formation are also described.

The treatment of the acute varieties is similar to that of prostitis, with which it is generally associated.

EPIDIDYMITIS

This is by far the most common complication of gonorrhoea and occurs in about 7 or 8% of all cases. It is due to the direct continuation of the inflammation from the urethra from the ejactulatory duct and vas deferens. In the majority of cases it follows posterior urethritis but in some cases Neisser and Jadassohn believe that the cocci may become lodged in the ejaculatory duct, while the posterior urethra escapes. It occurs generally within the first 3 weeks of gonorrhoea, and in rare cases it may be delayed months or years. Improper treatment, overexertion, sexual and alcoholic excess are said to favour its occurrence. It is generally unilateral and does not seem to affect one testicle any more frequently than the other, contrary to the usual belief.

Symptoms -- Neuralgic pains in the groin, and swelling of the cord, may usher in the attack. Usually they are not observed. Sudden and intense paid in the testicle which may be aching, dragging or shooting withfever indicate the onset of the disease. In many cases the urethral discharge becomes arrested or remarkably diminished in amount. The affected epididymis is greatly swollen and exquisitely tender

especially in its lowest part or globus minor, which is the first portion to become affected. When fully developed there is redness and oedema of the scrotum, and often effusion of fluid into the tunica vaginalis - Acute Hydrocele. This forms a tense tumour, which is often wrongly diagnosed as an inflammed testicle, but the most acute signs are definitely localised at the back of the swelling. The patient walks with his body bent forwards and his legs apart. Very severe cases produce sometimes collapse, abdominal pain, and tympany which may suggest a strangulated bowel especially if that testicle happens to be undescended. Thickening of the vas is present in all cases. In a few the testicle also is invaded by an extension of the inflammation along the coiled tube of the epididymis. Should the vas, as a result of its involvment, become blocked sterility, as regards the affected testicle, will result. Abscess formation is rare but chronic induration and chronic hydrocele more frequently occur.

Treatment - is conducted on the principles of other severe local inflammations, and when it subsides the indurated lump should be rubbed with linimentum potass. iodidi c sapone or weak oleate of mercury or the testicle should be strapped.

Cystitis, Pyelitis and Nephritis as in the case of the female are extremely rare except as a result of stricture.

Organic stricture of the urethra which so commonly follows gonorrhoeal urethitis is too large a subject to be discussed here.

GONORRHOEA IN WOMEN.

Gonorrhoea is far more common in men than in women, and when present it is painfully obvious to the former, and often missed in the latter. It is, however, the disease in women more than any other which is responsible for those complications which either destroy the reproductive function or necessitates the performance of surgical operations. The statement that it is far less common in females must, however, be taken with reserve, for many cases are missed owing first to want of symptoms, and secondly to its short duration in the urethra, and thirdly to the difficulty in finding gonococci in cervical and vaginal secretions which are produced by it. Of the various statistics published, those of Sanger show that 10 per cent. of all women have gonorrhoea, while Noeggerath gloomily finds 80 per cent. He also states that 90 % of sterile women owe their sterility to gonorrhoea infection from their husbands. Recognizing the servity and danger of such a disease, the bacteriological examination is of the greatest importance, for the majority of its complications are indistinguishable except by the microscope. Although so much has been written of recent years, I have had ample proof that the majority of practitioners are still under the impression that the gonoccoccus attacks primarily and chiefly the vagina, and with such belief, and without the microscope the presence of the gonoccoccus is wrongly taken for granted. That the urethre is the most constant seat of the disease is reported

by every observer, and the following statistics of Klein will shew that the vagina occupies the fourth position as regards frequency of infection.

In the urethra	65 to 100	per cent.
cervix	47 - 72	,,
uterus	14 - 50	,,
vagina	23 - 40	,,
Bartholin's glands	35	,,
vulva	12 to 25	,,
tubes	3½ - 33	,,

The urethra and cervix being the most frequent seat of the diease, infection of the male occurs by direct contact of the male urethra with these parts. The infection enters by mechanical separation of the lips of the meatus by contact with the female parts rather than by aspiration after ejaculation as suggested by Taylor. The period of incubation in the female is probably the same as in the male, except that in the former it is not easily determined owing to a non-recognition of the early symptoms of the disease.

URETHRITIS.

The acute stage presents symptoms very similar to those in man. In a few days after infection the same urinary sensations become replaced by burning pain aggravated by urination. Owing to the shortness of the urethra it is usually involved in its whole length, and consequently tenesmus and frequency of micturition are present in the majority of cases. The pain is referred to the meatus,

vulva, thighs, hypogastrium, or groins. The diagnosis is made on inspection when the orifice of the urethra will appear red and inflamed. Pouting of the mucous membrane, especially in its lower part, is common, and its region is seen to be bathed in yellowish pus. Should the parts have been recently cleansed, pus will appear by placing the finger in the vagina and compressing the urethra from behind forwards. The microscope reveals numerous gonococci in the pus, and there will be clearness of the second urine if the bladder is not involved. The acute stage usually subsides in about a week or ten days, and as already indicated, it may be so mild as to be altogether missed, or put down to a "cold." In many cases the disease becomes chronic. There are usually no symptoms, but by compression of the urethra several hours after urination, a small drop of whitish pus may be expressed; or in the deposit of the first urine, pus cells and gonococci will probably be found. The discharge in the chronic stage is often very irritating, and produces a chronic form of Vulvitis characterised by red spots and venereal warts. The various glands opening into the urethra are apt to be involved, and such involvement is a potent factor in the maintaining of the chronic discharge. Skene's glands are the most frequently involved, and on one occasion I was able to express from its duct a thread three-quarters of an inch long, containing gonococci. In this case there was no other sign of urethritis. Gaping of the urethra orifice, irregularity of its outline, are present in many cases.

with

Vulvitis.

This condition is often associated with urethritis, and may precede or follow it. In young girls it is generally infected directly. The symptoms are similar to urethritis, with increased severity and an inability to walk. These symptoms may be present without involvement of urethra. The vulva is inflamed and covered with pus, the hairs of the labia being matter togetner; there may be considerable swelling of the labia, on which may be seen small erosions of the epithelaum. These erosions must not be mistaken for soft shankers, with which they are often associated. The skin around the anus and inner surfaces of the thighs may be considerably irritated by the discharge. Inflammation of Bartholin's glands is not an uncommon complication owing to infection of its duct.

Vaginitis.

Gonorrhoeal Vaginitis is exceedingly rare. The explanations of this as offered by Bumm, Doderlein and others have already been stated. Clinically a vaginitis associated with gonorrhoeal urethritis, vulvitis, or endocervicitis, is fairly common. There can be no doubt that the vagina becomes infected by the careless use of the douche, or the patient being ignorant of her condition by coitus. In either case the infection has been carried up from the urethra or vulva. There are two regions of the vagina which are most commonly involved; these are the lower segment and the posterior fornax. Vagina becomes red, swollen, hot, tender, and covered with thick

pus. The tenderness is often so great as to render its examination, or the passage of a douche nozzle, impossible. At first, the mucous membrane is drier than normal, is less extensible than normal. The patient suffers considerable discomfort, even if there be no vulvitis. There is burning pain in the pelvis, aggravated by motion. As the inflammation subsides, or becomes chronic, the intensity of the local signs becomes diminished and the discharge less thick and more milky from admixture of epithelial cells. Superficial erosions and granulations are often to be seen. The diagnosis depends on the finding of the gonococcus, but as has been stated, it is frequently not found, and in its absence I believe the diagnosis may be justified when there is coincident gonorrhoeal inflammation of the urethra, vulva, or cervix.

Treatment.

The treatment of these conditions may be taken together. In urethritis the treatment is practically the same as in the male, except that owing to the shortness of the urethra, the disease more rapidly subsides, and therefore requires less vigorous treatment. In the early stages treatment should be entirely general. Alkalies and hyoscyamus give great relief, and often is all that is required. In severe cases hot sitz baths, and hot applications to the pudenda and hopogastrium are beneficial. At this stage vaginal injections probably do harm. When acute symptoms have subsided, injections into the ~~utnera~~ urethra and hot vaginal douches should be commenced. 2 % solution of protargol or not more than a dram at a time may be injected. Irrigation by a soft catheter or reflow tube

is recommenced by Taylor and others, but appear to me to be quite unnecessary in most cases and are not without danger of carrying infection to the bladder. Internally I have found no marked benefit from salol or urotropine. Santal oil should be given, for in addition to diminishing the urethritis, I have noticed a very marked general chronic effect produced by it. Silver nitrate 2 % may be applied on a dressed proba to the urethral canal.

Vulvitis --- Rest in bed and general cleanliness are essential, and hot hip baths and fomentations soothing, and tend to allay its inflammation. In some cases lint, wet with evaporating or lead and opium lotions, is beneficial. Strips of this should keep the labial surfaces apart. Sometimes the labia remain persistently swollen, especially if they be associated with superficial erosions. Here applications of silver nitrate (20 gr. to the oz.) should be applied. In mild cases stringent dusting powders are better. The vagina should be douched with a hot antiseptic lotion to prevent the spread of the disease upwards.

Vaginitis --- As soon as the condition is recognised copious irrigations of hot water should be commenced and repeated several times daily. This will be enough to allay the acuteness of the inflammation when an attempt should be made to destroy the gonococci by the use of perchloride of mercury 1 in 4,000, or even 1 in 2,000. As soon as they can be borne, the injections should be followed by the introduction of medicated tampons of wool or gauze so as to keep the surfaces ℘ apart, as well as influencing beneficially the inflammation.

Protargal Ichthyol Hydrastis or Boric Acid, combined with glycerine, may be used in these tampons. They frequently in the acute stage cause considerable discomfort or pain, but their benefit when retained is often marked. When the disease becomes chronic, painting the surface through a speculum with silver nitrate or sopper sulphate, 5 to 10 %, every third or fourth day, combined with irrigation as above, will generally affect a cure.

Vulvo-vaginitis also occurs in children from accidental infection.

I shall here consider briefly some of the minor complications before passing to the description of gonorrhoeal inflammation of the uterus.

Bartholinitis.

This is perhaps the most important complication affecting the external genitalia. The acute form is not common. Only five cases have come under my care in the Royal Albert Hospital during the past year. It may occur at any stage of the above affections and is due to infection and subsequent blocking of the duct. It is said to be most common on the left side, but three of my cases were on the right. It usually terminates in suppuration and at this stage there appears a large red swelling in the posterior part of the greater lip, fluctuating in its centre with considerable inflammatory oedema around. The lesser lip is frequently involved, and if not opened will burst on its inner side. Other pyogenic organisms are the exciting cause of the separation. I have not succeeded in finding

gonococci though they are probably present in most cases. The foetor of the pus which is sometimes marked is due to the presence of the colon vacillus. The chronic form presents itself as a small tumour well defined and freely movable. It is a retention cyst and such cysts are believed by Sanger to be a certain indication of preexisting gonorrhoea. These cysts may empty themselves from pressure but they soon refill. Gonococci have been found in them, & as a result of mixed infection they separate. A sub-acute form is not usually described, but it appears to me to be the most common of all. It is a catarrh of the duct, and from it may be squeezed a muco-purulent discharge containing gonococci. These may persist indefinitely as a fruitful source of infection, and at any stage cystic formation or circulation may follow. The orifice of the duct may be recognised as a small reddish and moist spot, one on each side of the vaginal orifice just in front of the hymen.

Treatment -- The abscess must be thoroughly opened, scarped and packed. The cyst should be excised. The discharging duct should be laid open and some caustic applied to its entire surface.

Cystitis.

A degree of hyperaemia of the neck of the bladder is frequently associated with urethritis and is chiefly responsible for the increased frequency and urgency of micturition. True gonorrhoeal inflammation of the bladder is very uncommon, but more common than in the male. When it occurs it is in most cases dependent on other organisms associated with the gonococcus. The symptoms are as above stated with increased servity and mild febrile

disturbance. By the two glass test the second urine, especially its last portion, will shew an increased amount of mucous and always a certain amount of pus in the deposit. The reaction will probably be alkaline owing to decomposition of the urea by pyogenic cocci, but in pure cases of gonococcal infection, and those due to the colon bacillus, the reaction will be unchanged, as these do not decompose urea (1).

Treatment -- consists in the removal of the infecting focus and the relief of symptoms as under urethritis. Salol or urotropine, especially the latter, are most efficacious when there is much decomposition in the urine. In chronic cases frequent irrigations of the bladder are indicated.

Remote but very rare complications are Pyelitis and Nephritis.

Gonorrhoea of the Uterus & its Appendages.

Endocervitis ---- Although the os uteri is next to the urethra, the most frequent seat of gonorrhoeal infection, its consideration has been deferred for convenience of description only. The anatomical position of the cervix renders it the most likely seat of infection for an emission carrying with it gonococci would first be brought in contact with it. It may occur associated with a urethritis or independently of it. In most cases it gives rise to no marked symptoms, but there may be a dull pain or a sense of weight in the pelvis. The patient, however, soon becomes aware of a discharge, for which she seeks advice. In the

majority of cases the patient is first seen when the disease is well advanced or chronic. On examination the cervix in the early stages may shew slight increase of its readiness or even be purplish with swelling. In many cases there is no such change, but from the os escapes a purulent discharge containing gonococci. Later the discharge is mucu-purulent or may be simply an excessive amount of the normal mucous. Frequently also will be seen a patch of erosion, especially on the posterior lip, so common. Cocci tend to become buried in the Nabothian follicles and there keep up the chronic discharge. They may not be found even after repeated examination, and in making the diagnosis other factors already described must be taken into account. The glassy plug in these cases is frequently sterile, but the products of the curette should be always examined for the cocci.

Endometritis ---- In a few cases may follow direct extension of the disease. The cavity of the uterus has been shewn to be free from organisms (in health) and that the os externum acts as a barrier to their entry. The gonococcus is however the exception. Infection often spreads to the myometrium and the symptoms will then be those of an acute metritis. This metritis is most commonly associated with perimetritis, so that on examination in the acute stage, in addition to heat and tenderness of the vagina, the uterus will be found fixed. When the disease becomes chronic there will be a free purulent discharge in which gonococci unassociated with other organisms is found in about 30 % of the cases. This condition is often very persistent, and the symptoms of disordered menstruation and digestion, with pains in

the back are apt to produce such chronic invalidism as to render the patient a miserable and useless member of society. Such a case is now under my care. On admission she was extremely emaciated, enemic and depressed - almost to the extent of melancholia. Her appearance suggested malignant disease or some other grave malady. She had suffered from Leucorrhoea, with pain in the loins, abdomen and pelvis for the past seven years. She is unmarried, age 25, and denies having had sexual intercourse until six months ago, when she complained of urinary irritation soon after. Her occupation as a bar-maid in this town rather leads me to doubt her statements. On examination pus could be expressed in large amount from the urethra, and this contained numerous gonococci. The vagina was healthy but filled with thick yellow pus coming from the os uteri, but I did not succeed in finding gonococci. The uterus was slightly enlarged, and its motility impaired. The cervix was conical and ~~the~~ nulliparous. The appendages appeared to be healthy. Hot antiseptic douches were ordered, and five days after the os was dilated with difficulty and the uterus curretted. It was then thoroughly irrigated and iodised phenol applied, and iodoform gauze introduced for 24 hours. Subsequently she had frequent douches and tampons of glycerine of protargol 10 %. The urethritis, though one of the most resistent I have had to treat, succumbed to Oi. Santali, and the injections of 1 dram of a 2 % solution protargol. In spite of careful performance, curettage a peritoneal complication was set up which was at first very alarming. This was probably due to the force

dilator, and the resulting inoculation of the peritoneum through one of the tubes. She is now slowly recovering with a slight but persistent pain in the left side, and probably gonorrhoeal salpingitis is at the bottom of it. Gonorrhoeal endometritis should be treated on the lines indicated above. When the disease is confined in the cervix curetting is also necessary, and the areas of erosion should be scraped and touched with some caustic such as pure Carbolic, silver nitrate, or chloride of zinc. In these cases a strip of gause a strip of gause, wet with pure carbolic, and introduced within the cervix, at once destroys the cocci and effectually drains the inflammatory products.

Salpingitis.

The gonococcus is by far the most frequent cause of purulent salpingitis. Of twenty-four cases recorded by Wertheim, these cocci were found in sixteen. Menge and others have obtained similar results. The organism is generally found alone, but in a few cases was associated with the turbercle bacillus or with other pyogenic cocci. In those cases in which the pus had been sterile gonococci may have been the active agents. The disease is the result of the spread of infection from the engometrium and may be acute or chronic. Acute gonorrnoeal salpingitis is generally purulent from the beginning, and histologically presents similar appearance to catarrhal inflammation of the lining of other mucous tubes. Owing to the escape of a small quantity of pus through the ostium abdominale or to the spread of infection through the wall

of the Fallopian tube, the results will be those of a localised peritonitis, the servity of which varies with the amount and virulence of the infective material. The symptoms are usually mild and result in the formation of adhesions of the tube to neighbouring structures and the closure of the abdominal ostium. In rare cases death results from general peritonitis. In most cases also the uterine opening closes, so that the pus becomes retained within the tube forming a Pyosalpinx. The pus so accumulated may, in a few cases, burst into the cavity of the uterus. I believe the following case illustrates that fact, though perhaps the evidence in favor of the belief is not strong. The patient was admitted into the Royal Albert Hospital with a diagnosis of acute Appendicitis with sudden onset and said to follow a slight injury to the abdomen. On examination I found that she had definite signs of pelvic peritonitis which was most marked on the right side. There was a small dull area and muscular rigidity in the region of the right tube. The vaginal walls were hot and tender and the uterus fixed and pushed slightly to the left side, and the fornices apparently occupied by inflammatory exudation. Her temperature was 101 degrees on admission and remained elevated with morning remissions for a week. By simple treatment her symptons subsided and in three weeks she was convalescent. An indefinite fullness, however, persisted in the right lateral fornix and she suffered from slight colicky pains in the abdomen. During this time there was no discharge from any part of the genital tract, but one

day during convalescence she had a sudden and profuse purulent discharge from the vagina which lasted only two days and caused considerable relief and a rapid improvement in her condition followed. This discharge was seen to come from the os uteri and I believe its origin was the right Fallopian tube. No specific organism was found, but on enquiry I learnt that three months previous she had symptoms of gonorrhoeal urethritis. This case therefore illustrates how gonorrhoeal salpingitis may be missed. Pyosalpinx more usually produces a tumour (often sausage shaped) which is characterised by its want of definite symptoms and signs, only slight, if any, febrile re-action, paroxisms of pain, and recurrent attacks of localized peritonitis or ovaritis. The tumour, whose wall tends to become much thickened, and may be attached by adhesions in a variety of positions in the pelvis, is often so tense as to feel solid, but in some cases fluctuation may be made out. The fimbriated end often becomes attached to the ovary, which may be included in the suppurative process. Evidence of previous gonorrhoea may often be found by microscopic examination of the urethra, cervix or vulvar glands, or the patient may give a suggestive history and perhaps one of previous attacks of peritonitis. The diagnosis, which is often attended with great difficulty, ~~and~~ must be made from pyosalpinx from other causes, and as its pathology and symtomatology do not differ very materially from them, I shall not describe them. The treatment is mainly surgical.

Peritonitis.

This may be due to extension of gonorrhoeal inflammation through the wall of the uterus constituting perimetritis already referred to. As a result, the uterus becomes fixed by adhesions in front or behind, producing one of the antro-posterior displacements of this organ. More commonly it follows the escape of pus from the Fallopian tube (which may be either affected with catarrhal inflammation or pyoselpinx. The tendency of this form of peritonitis is towards early resolution with the formation of adhesions. Suppuration is exceptional, and when it occurs it is usually small in extent and well shut off. These adhesions invariably cause such anotomical derangements of the organs as to induce sterility. Such displacements of the uterus are extremely common in prostitutes, but in them pregnancy, as well as the gonococcus plays a very important rôle. In nearly every case in which I have found a displacement, the patient had not only been pregnant but since that labour has been sterile. Gonorrhoeal infection during the puerperium produces most commonly some degree of peritonitis.

Pelvic Cellulitis of Gonorrhoeal origin does not occur (1).

Oophoritis is not uncommon and is due to infection from a diseased tube. It is generally superficial and may form a tubo-ovarian abscess, or form adhesions to neighbouring structures. It often terminates in atrophy

(1) Allbutt and Playfair's Gynecology p.509.

or cystic formation.

Sterility.

Gonorrhœa, as already stated, is the commonest cause of sterility because of the number of complications which follow it. Any one of them already mentioned may be a cause. Perhaps the most common is endocervicitis and endometritis. These either prevent the entrance of spermatozoa or render the soil unsuitable for the development of the ovum. Peritonitis causing uterine or ovarian displacements, or stricture of the Fillopian tube is probably the next most frequent cause. The ovary may be so displaced, or so surrounded by adhesions, as to render ovulation impossible or fruitless. Tubal disease also by obstructing the natural path of the ovum.

Vaginitis, Valvitis, and Bartholinitis cause a temporary sterility owing to the dyspareunia induced.

GONORRHOEAL OPHTHALMIA.

A severe inflammation of the cunjunctiva, the result of innoculation of gonorrhoeal pus,

1. In the adult as a rare accident
2. In the infant during birth and known as ophthalmia neonatorum.

Considering the frequency of gonorrnoea and the infrequency with which the lower class patient cleanses his hands after touching the infectious pus, it is surprising that the disease is not more common.

Symptoms -- In about 24 hours the appearances and symptoms are like an ordinary conjunctivitis, but soon the inflammation becomes severe with marked chemosas of the vulvar conguntiva and swelling of the lids. A profuse and purulent secretion then runs from the eye, and in it gonccocci are to be found. In severe cases ulceration of the cornea occurs, and this is the chief danger of the affection. It may lead to opacitivis or may perforate, the serious consequences of which I need not describe here.

In the treatment a remedy has not yet been found to supercede the application of silver nitrate to the lids, and in the ophthalmic department of this Hospital protargol has been given a good trial and found disappointing.

I may mention that a somewhat unnatural and bold use has been made of the pus from gonorrnoeal urethritis, and that is in the treatment of pannus.

GONORRHOEAL RHEUMATISM.

This occurs as a complication of gonorrhoeal urethritis or ophthalmia in about 10 % of the cases. Much of its pathology has already been discussed. It is probably the most formidable complication, for it is often most severe, extremely chronic, and in some cases almost incurable. It is more common in men than in women and affects chiefly the synovial membrane of joints and produces a condition of hydarthrosis. In other cases the ligaments and tissues around the joint are chiefly affected. Acute inflammation of the knee is the foremost commonly seen, but such inflammation may affect several joints at the same time. Next to the knee in order of frequency comes the ancle, elbow, wrist, small joints of the fingers and vertebrae. In acute cases the joint suddenly gives the signs and symptoms of acute inflammation with fever, and then in a week or two begins slowly to subside. This subsiding stage may last months and it is characterised by a uniform swelling around the joints which may contain fluid, slight redness and oedema and a very persistent stiffness. The muscles acting on the joint become wasted and the patient quite crippled. When the joints of the fingers are affected the hand presents a very characteristic picture -- Stiff and swollen fingers a helpless and spadelike hand. The chronic form often ends in complete fibrous anchylosis of the joint. Suppuration is rare. Inflammation of fasciae and tendon

sheaths often occurs along with the acute arthritis or independently of it. The extensors of the fingers and toes show all the appearances of inflammation, The plantar fascia and fascia of the thigh is often exceedingly painful. Affection of the bursae, especially that beneath the tendo achillis is common.

Cardiac and other complications may occur.

The diagnosis depends on the existence, or history of gonorrhoea and on the local signs.

Treatment as regards a specific remedy is most unsatisfactory. Attempts must be made to remove the source of infection, cooling and sedative applications should be made to the inflamed areas. When the acute stage has subsided iodide of potassium, tonics and cod-liver oil, combined with counter-irritation and later massage, slowly bring about improvement and eventually a cure.

Index of Microscopic slides sent in illustration

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1 Pus from urethritis ♂ male - declining stage
Stain — watery fuchsin
Shows (especially within the circle marked off)
Numerous groups of gonococci, chiefly in pus cells
& also in epithelial cell, few groups & isolated cocci lying free.

2 Pus from similar case.
Stain - eosin watery solution 2 min.
Löffler's methylen blue 5 min.

3 Acute urethritis
Stain — Acetic acid 3 seconds
Loeffler's blue 7 minutes
Watery eosin 1 min.

4 Female urethritis - declining
Stained by Schütz's method.
Cocci blue, cells salmon yellow especially within circle.

5 Male urethritis acute
Stain Carbol - Thionin 2 minutes.

6 From urine result of massage of prostate in declining post. urethritis
Stained by Gram counterstain fuchsin.
Shows spermatozoa, pus + epithelial cells
A few gonococci (red), groups of diplococci urethrae communis (violet) + bacilli coli (red).
See page

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7 Purulent vaginitis
Stained by Gram & saffranine
Shows numerous bacilli (purple) probably vaginal bacilli. One group of gonococci - See page 13

8 Pure cultures of gonococci grown on blood-agar 2 days old.
Also shows on one side staphylococci for contrast.
Stain by Gram - saffranine.

9 G. Degenerated gonococci in almost pure culture - grown on ascitic fluid + agar 3 days old.
Shows in one corner pure culture diplococci urethrae.
Stain Gram + fuchsin.