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PYELITIS IN PREGNANCY AND THE PUERPERIUM.*

BY

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PYELITIS in pregnancy and the puerperium has of late years deservedly been attracting a great deal of attention. It is interesting to trace its history. As far as I can learn from a study of the literature, the first mention of the disease is to be found in Rayer's work, Traité de maladies des reins, published in 1841. He says, "Le developpement de la matrice dans la grossesse est une cause frequente de la cystite de distension renale et par suite d'inflammation des ureteres des bassinets et des reins." Thereafter the subject seems to have fallen into oblivion until 30 years later when Kaltenbach (*Archiv f. Gyn.*, Vol. iii, page 1), in writing of a case of pyelitis in 1871, says as follows: "Acute pyelitis in pregnancy has not up to the present time received any attention from any quarter and is of especial interest in that it may be observed in an analogous manner in the puerperium and after gynecological operations."

W. M. Chamberlain (8) gets the credit with some writers of having written about the disease in this country in 1877. He writes: "The urinary tract in its whole length is especially liable to share in any and every morbid process which may follow childbirth and that the disease of the urinary tract thus excited has a very marked influence upon the issues of the puerperal state, and sometimes assumes the leading rôle among the causes of death."

This scarcely can, however, be accepted as a recognition of

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pyelitis either in pregnancy or even in the puerperium. It signifies, to my mind, that the author recognized that the bladder, ureter and kidneys may become affected in puerperal sepsis.

In 1889, twelve years later, Kruse (20) wrote a dissertation on the subject on the basis of a case observed in the Charité at Berlin, but made no mention of the previous writers. This paper failed also to excite any interest, and it was not until 1892, three years later, when Reblaub (35) presented his communication to the French Surgical Congress, reporting, in clear outlines, five carefully observed cases, that the interest of the medical world became fully aroused to the importance and entity of the disease.

To the President of this Society, Dr. E. B. Cragin (9), the credit must be given for presenting the subject before the profession in this country by his clear, concise paper read before the American Gynecological Society, May 24, 1904, and published in the *Medical Record*, July 16, 1904.

Frequency.—Opitz (30), in 1905, was able to collect in the literature only 76 cases and published eight cases of his own, making 84 cases in all. Since the paper by Opitz I have been able to find 123 cases recorded in the literature. Of these 52 are reported by Albeck (3) from the Copenhagen Maternity. Albeck states that the disease is often to be met with during labor, when it is frequently masked by the labor pains. He asserts that pyuria is not an infrequent accompaniment of pregnancy and parturition. In the Copenhagen Maternity the urine of every inmate is carefully examined on admission and if it shows the slightest trace of albumin it is subjected to a thorough microscopic examination. It is then examined every second or third day during the patient's stay in the hospital. From 1900 to 1905 there were 7648 parturient women, and pyuria was observed in 450 cases (5.86 per cent.), of these 6.56 per cent. occurred in primapara and 4.84 per cent. in multipara. That the disease occurs much more frequently than the recorded cases would indicate may be safely assumed, as it is far from being generally recognized by the profession at large. The records of the Copenhagen maternity, however, may be taken as a fairly safe guide of the frequency of the disease.

Etiology.—For the causation of pyelitis in pregnancy two conditions are generally assumed to be essential: (1) obstruction in some part of the urinary tract and (2) pathogenic bacteria. That the pregnant uterus frequently compressed the ureters and

brought about their dilatation was already known to Cruveilhier. He stated, "I have observed that the ureters were found markedly dilated in all of the women who died right after confinement or during the latter months of pregnancy." Since his time a number of good observers have noted the same condition, notably Olshausen, Halbertsma (17), Sippel (41) and others. These observers have found that the dilatation was most frequently met with in the right ureter. Pollack (33) in 130 autopsies in eclamptic cases in the Vienna Hospital from 1881 to 1902 found dilatation of the ureters in 35 cases (26 per cent.). In 18 of these cases both ureters were dilated. In the remaining 17 cases the right ureter only was found dilated. This coincides with the clinical fact observed in pyelitis in pregnancy that the right kidney is by far the one most frequently affected. The explanation of this is to be found in the anatomical relation of right ureter as it crosses the brim of the pelvis making more of an acute curve and lying more exposed than the left ureter. Another factor tending to compression of the right ureter is the position of the pregnant uterus itself, lying as it does more frequently in the right oblique diameter of the pelvis. The greater frequency of the fetal head occupying the right oblique diameter is stated as still another factor favoring pressure upon the right ureter. The occurrence of pyelitis in the early months of pregnancy militates against the view that the fetal head plays any rôle in the causation of the compression of the ureter. Cathala (7) holds that the compression is brought about by the traction exercised upon the ureters by the inferior uterine segment as it rises up in the pelvis. Other observers maintain that the pressure upon the ureters is caused by the lower segment of the enlarged uterus. It is assumed that the mucosa of the ureter partakes of the general hyperemia of the pelvic organs attendant upon the pregnant state, and in consequence a slight pressure or a slight traction of the ureter would be sufficient to partially close its canal and thus obstruct the current of urine. It has been demonstrated by experiments on the lower animals that the urine flows through the ureter under very low pressure. Englemann and Bouvin* have shown that a pressure of 5 mm. upon 8 mm. length of the ureter is sufficient to arrest a column of urine in the ureter of 400 mm. in height. They have further shown that on continued pressure upon the ureter the peristaltic waves issuing from the kidney are arrested at the point of pressure and

*Cited by Mirabeau.

that the ureter below this point does not partake of the peristaltic movements. Mirabeau (27) brings forth a novel view regarding the cause of the obstruction of the flow of urine in the upper urinary tract. He rejects the views hitherto held, and asks, if they are correct, what explanation can be offered for the enlargement of the pelvic portion of the ureter. He maintains that the obstruction to the urinary current is brought about by the changes of the bladder mucosa incident to pregnancy. He has found on cystoscopic examinations during pregnancy that the bladder mucosa, especially that surrounding the ureteral orifices, undergoes marked hypertrophy forming a wall-like obstruction to the flow of urine from the mouths of the ureters. This obstruction he deems sufficient to bring about a stagnation of the urine in the ureters and pelvis of the kidney. Gauss (14) confirms these observations from a cystoscopic study of the bladder in several pregnant women. Prior to these observations Stöckel* had already drawn attention to the changes of the bladder wall that he had noted in the puerperal state which consisted in an edema of the bladder mucosa, especially that about the neck of the bladder, and in numerous ecchymoses in the same region. He attributed these changes to the traumatism to which this portion of the bladder was subjected to during labor. We have seen that, although there is a diversity of opinion as to how the obstruction of the upper tract is brought about, all agree as to the existence of the obstruction.

There are three recognized modes of infection: (1) Ascending from the bladder; (2) through the blood-current—*i. e.*, descending from the kidney; (3) through the lymph-channels. The latter may practically be excluded from the present topic as it has reference to the extension of a purulent process in the neighborhood of the urinary tract. The hematogenous infection or the descending infection finds most of its adherents among the French authors, while the German authors are more inclined to favor the view of an ascending infection. Nearly all agree that the infecting agent in the vast majority of cases is the colon bacillus. Albeck (3), who has made an especial study of the bacteria in the pyuria of pregnancy, has found that in 55 cases of bacteriuria the colon bacillus in pure culture was found 43 times, the streptococcus 9 times and the staphylococcus albus 3 times. This vast preponderance of colon bacillus infection corresponds in the main with the data furnished by other observers. Len-

* Cited by Mirabeau.

hartz (23) in 80 cases of pyelitis (19 of which occurred in pregnancy and the puerperium) the colon bacillus was the only microorganism found in 66 cases.

For some time past, however, as a result of some of the incidents connected with the cases that have come under my own observation, I have thought that the gonococcus played a not inconsiderable part in the causation of the pyelitis in pregnancy and in the puerperium. For example, one of my patients (Case XI) went through an acute gonorrheal cystitis (gonococci were found in the urine) about nine months before she became pregnant. I was naturally anxious throughout her pregnancy, which progressed to term without incident. Labor was uneventful, she was having an afebrile puerperium, but on the twelfth day she was seized with a chill followed by fever and with severe pain over the left kidney and she went through a moderately severe attack of pyelitis lasting about two weeks. The pyuria persisted for sometime afterward, but finally disappeared completely. Numerous bacteria were found in the urine, but none of a definite nature. Two additional cases in my series of cases presented evidences of prior gonorrheal infection. It was therefore gratifying to me to find that Mirabeau, in an excellent article in 1907 as a Festschrift to Professor von Winckel, has arrived at the same conclusion. He divides pyelitis of pregnancy into four varieties, according to the infecting agent: (1) Gonorrheal infection; (2) pus cocci infection; (3) colon bacillus infection; (4) tuberculous infection. He holds that each presents a distinct clinical picture and runs a characteristic course. The evidence he adduces is rather convincing and is based on ten cases coming under his own direct observation and a number of others in whom he had made a cystoscopic examination.

Gonococci were found in the urine from the kidney by Mirabeau (27), Opitz (30), Schwab (40), Gaussel (15) and Fournier (12).

That gonococci have not been more frequently found is, no doubt, due to the fact that that organism is not so easily detected in the presence of other bacteria. Where marked bladder symptoms precede the kidney symptoms, gonorrheal infection should be suspected.

The right kidney is the one affected in the vast preponderance of cases. In 135 cases collected by Opitz (30) and the writer the right kidney was affected 91 times, the left kidney 22 times, both kidneys 10 times and 10 times it was not stated which kidney was involved.

Contrary to what some writers have stated, there is no preponderance of cases among primigravisdæ. In 66 cases in Opitz's (30) collection there were 32 primigravisdæ and 34 multipara.

In the majority of cases the disease sets in during the latter half of pregnancy. In 161 cases comprising Opitz's series and the writer's the onset of the disease was four times in the third month, 10 times in the fourth month, 29 times in the fifth month, 28 times in the sixth month, 29 times in the seventh month, 18 times in the ninth month and 24 times in the tenth month.

Symptoms and Course.—In practice one meets with two varieties, differing chiefly in the onset. In one there is a preliminary period, of longer or shorter duration, of bladder disturbances characterized by frequent and painful micturition, with some tenesmus and a sense of burning over the bladder region. In addition there is more or less malaise. In the other variety the onset is sudden, resembling an acute infection ushered in by a chill and followed by marked elevation of temperature. The chill may be repeated daily and the morning and evening temperatures show marked remissions from 97° to 104°. The pulse will vary from 90 to 110 and 120, but the rapidity of the pulse, as a rule, bears no ratio to the elevation of the temperature. Still the patient makes an impression of being seriously ill, the tongue is coated with a heavy fur and may be dry; there is loss of appetite, nausea and even vomiting may be present. At first the pain is not localized but is diffused over one-half of the abdomen, usually the right, but in the course of a few days the pain becomes localized over the region of the affected kidney, which as we have seen is usually the right kidney. The kidney, as a rule, is not found enlarged, but deep pressure over the affected region will elicit marked tenderness. To be able to carry out this procedure it is often necessary to place the patient in a favorable position; that is, in a semi-prone position, half-way between the side and back, with the knees moderately flexed. The patient is then requested to take a deep breath and pressure is applied over the region of the kidney by the fingers of one hand just in front of the muscles of the back and the fingers of the other hand below the rib border in front. Tenderness on pressure over the McBurney point or, in other words, over the point where the right ureter crosses the iliac vessels is a symptom which is described by many writers. The writer did not find it in any of his cases. On the other hand, on vaginal examination thickening

and tenderness of the ureter as it crosses the anterior wall of the vagina is present in a certain number of cases.

The urine at the beginning may show no change beyond a trace of albumin and a rather high color. In the course of a day or two, however, it will present the characteristic features. The specific gravity will vary from 1006 to 1020, the reaction will be acid, and the odor pungent; it will be turbid when first passed, but on standing a thick sediment will deposit. This on microscopic examination will be found to consist chiefly of pus, a few red blood-corpuscles, numerous caudate epithelia, a few hyaline granular casts and numerous rod-shaped bacteria. On bacteriological examination the colon bacillus may be found in pure culture, rarely mixed with streptococci or staphylococci, and in a certain percentage of cases the latter cocci will be found alone. In a few cases the gonococcus of Neisser will be the only organism found. The quantity of pus will vary in the different specimens passed in the 24 hours. Coincident with a heavy deposit of pus there is usually a subsidence of the fever and the pain for obvious reasons. It may sometimes happen that the urine will be free from pus for an entire day, showing that the obstruction to the flow of urine from the affected kidney has for that period become complete.

According to Mirabeau (27), each infecting microorganism presents a clinical picture of its own. In gonorrheal infection, about the fifth or tenth week of pregnancy he says there will be bladder disturbances, manifested by a burning sensation in the bladder and urethra, frequent micturition with tenesmus, difficulty in voiding, and pain particularly at the end of the act. to a mixture of mucus, and scanty leucocytes, which may The urine at this stage will show light, diffuse turbidity due show Neisser's diplococci. These symptoms do not persist for a very long time. Later, dull aching pain is felt in both sides, which the patients attribute to stretching of the uterine ligaments, but which in reality are due to an inflammatory irritation of the ureters. Then, after a shorter or longer interval, during which the bladder symptoms have been entirely forgotten, there develops suddenly high fever with abdominal pain which soon becomes localized to the region of one kidney and later the pain is felt also in the other kidney. In these cases the right kidney need not to be the one most frequently involved, and in a large percentage of cases both kidneys become affected in the course of the illness. In this acute stage of the illness the urine appears

turbid, without depositing on standing a heavy sediment of pus. The reaction is neutral, the sediment shows, in addition to numerous epithelia from the ureters and pelvis of the kidney, numerous leucocytes, a few Neisser's diplococci, pus cocci and rods. The quantity of urine is markedly diminished, the specific gravity is rather high and the percentage of albumin corresponds to the quantity of pus. On cystoscopic examination the bladder will show, in addition to the usual changes attendent upon the pregnant state, those which are characteristic of gonorrheal infection—inflammatory areas localized at the trigonum and neck of the bladder. The acute symptoms in this form of infection usually subside after a time. Recurrences during the subsequent course of pregnancy are common. During the puerperium there may develop symptoms showing that there is a gonorrheal ascending infection of the genital organs.

I have quoted Mirabeau rather at length because in my opinion his description is founded on correct observations and corresponds, in a measure, with that I have made for myself.

In the cases due to colon bacterial infection the onset is preceded or accompanied by intestinal disturbances, such as diarrhea or obstinate constipation. It is in this variety that in the vast majority of cases the right kidney is the one affected. The urine may not show any change for two or three days, and during this stage a diagnosis is not easily made. But when the changes do occur they are characteristic of colon infection. The urine has a milky turbidity and does not become clear even after standing and after a sediment has formed. The sediment consists chiefly of pus corpuscles and numerous bacilli which prove generally to be a pure culture of the colon bacillus.

According to some French authors, there is a presuppurative stage, in which the urine is free from pus but loaded with bacteria.

Bar (4) reports a couple of obscure cases of fever, emaciation and ill health which he attributes to bacteriuria. Albeck (3), on the other hand, has frequently met with bacteriuria which was not attended nor followed by any grave consequences. In 392 cases of pregnancy be found bacteriuria 32 times unattended by any symptoms. The organisms found were the colon bacillus 24 times, the streptococcus 7 times and the staphylococcus albus once. Bredier (6), in 1902, described a form of pyuria without fever, Albeck (3) met with it 18 times in the routine examination of 392 pregnant and parturient women. Bredier (6) states that this form usually sets in at the end of pregnancy in contra-dis-

tinction to the acute febrile form which develops generally at about the middle of gestation. He states further that if we were to put all the cases of pyuria without fever into one group we would find various clinical pictures, cases in which there is severe pain referred to the kidney and ureter and, on the other hand, cases in which the only symptom is the pyuria and which owes its detection merely to the routine examination of the urine of the pregnant woman.

During the past summer I had a case (Case XIII) in my practice of this variety that caused me unnecessary alarm. The young woman had a very bad tubercular family history and she herself manifested suspicious symptoms of pulmonary tuberculosis before she became pregnant. When her pregnancy (which was her first) had advanced to the ninth month the urine showed a marked trace of albumin and microscopically numerous pus corpuscles. There was an entire absence of fever, pain or urinary symptoms. I feared a tubercular affection of the kidney. The pyuria persisted wihtout any other symptoms until delivery which was at time and was normal, as was the puerperium. The pus in the urine gradually disappeared after the delivery and with it the trace of albumin. The health of the patient has remained good up to the present time.

Diagnosis.—With the knowledge we now possess of pyelitis in pregnancy and the puerperium, its diagnosis ought not to be difficult; still it is rare that the medical attendant makes the correct diagnosis. Acute appendicitis, acute cholecystitis, typhoid fever, acute salpingitis, retained dead fetus and pleurisy have all been mistaken for the disease in question.

Acute Appendicitis.—This is the disease which is most frequently diagnosticated for pyelitis in pregnancy. In one case I had great difficulty in convincing a colleague whose wife had pyelitis in the second week of the puerperium that it was not a case of acute appendicitis requiring immediate operation. The history pointed to a gonorrheal infection of the bladder shortly after marriage. If we bear in mind that acute appendicitis is rather rare in pregnancy (*vide* article by the writer, page 843), that it is seldom ushered in by a chill, and followed by daily chills with marked remission in the fever course and that urinary symptoms are absent, we will seldom make the mistake. It is true that in pyelitis pain and tenderness over the McBurney point may be present, but by the time the pain has become localized at this point, there is also localization of the pain over the

corresponding kidney region. Further, the urine by this time will show its characteristic features. Another aid in the differential diagnosis will often be found on vaginal examination when the pelvic portion of the ureter of the affected side will be found thickened and tender where it crosses the anterior vaginal wall to enter the bladder. A cystoscopic examination is of considerable value in this regard, according to Mirabeau (27) and others. The error most frequently committed by the medical attendant is that he only thinks of the nephritis of pregnancy and gives no thought to an inflammation of the pelvis of the kidney.

Acute Cholecystitis.—The pain in this affection is usually characteristic, being referred, as a rule, to the epigastric region and shooting through to the back. On close questioning it will be learned that there have been similar attacks before pregnancy had set in. The point of greatest tenderness will be in the right hypochondrium and not in the right lumbar region.

Typhoid Fever.—Pyelitis in pregnancy sometimes has some features in common with the onset of typhoid fever. There is the preceding malaise, then the sudden development of high fever, preceded by one or more chills and the comparatively slow pulse. In cases presenting such features a positive diagnosis must be deferred for a couple of days or even longer. I recall a postpartum case seen with Dr. Mendel. There were some urinary symptoms present in the case, such as dysuria and a small amount of pus. Still the impression made upon me was that we were dealing with a case of typhoid fever. The patient was admitted into Mount Sinai Hospital. The first couple Widal tests were negative, later they became positive. The patient went through a moderately severe course of typhoid fever and her urinary symptoms were found to be dependent upon a cystitis.

It is not necessary to enter into the differential diagnosis of the other affections mentioned.

In pyelitis of the puerperium the differential diagnosis is not so easy, as pyelitis may only be one of the processes in puerperal septicemia. For instance, in a case observed by me of severe septicemia following criminal abortion there was a marked double pyelitis. Such a complication in puerperal sepsis or septicemia has been recognized for a long time and no doubt was what Chamberlain had in mind in the paper already referred to. Hence, to diagnosticate the pyelitis of the puerperium one must be able to exclude positively a general puerperal infection. This

can readily be done in some cases, in others the diagnosis may have to remain in doubt for a time. In the two cases, the reports of which are appended to this paper, I found no difficulty in excluding puerperal septicemia.

Prognosis.—The prognosis, so far as the mother is concerned, is, as a rule, good. In the majority of the cases the disease under appropriate treatment runs its course from 7 to 14 days. But not a few cases show no such limitation, the disease persists until pregnancy is interrupted artificially or spontaneously, or relief is afforded by purely surgical measures. In one of my cases (Case IV) the affection ran a very acute course for several weeks until abortion set in spontaneously.

Recurrences in the same pregnancy have been observed by several writers. Recurrences in subsequent pregnancies have been recorded by Barth (5).

One of my patients went through a subsequent pregnancy two years after the attack without any recurrences. Another patient went through two pregnancies subsequently with the same results. Several similar cases are recorded in the literature. Still it is not safe to allow a woman to become pregnant again shortly after having passed through an attack. The urine should remain entirely free from pus or bacteria for months before she should be permitted to run the risk of another pregnancy. Deaths have been recorded by Perret (32), Guyon, P. Müller (2 cases), Cumston (10) and Halle. I doubt very much, however, if this is a true indication of the mortality. A number of the cases recorded in the literature passed from observation while there was still considerable pus in the urine. The subsequent fate of these cases is unknown. The prognosis for the child in utero is not very good, as the pregnancy is interrupted either artificially or spontaneously in a fair percentage of the cases. In 32 of the cases the writer collected in only 17 did the pregnancy progress to term.

Treatment.—This consists in rest in bed, an ice-bag over the affected kidney, milk diet, a moderate quantity of water, lying on the opposite side to that of the affected kidney and the administration of some urinary antiseptic, preferably urotropin. Helmitol is highly spoken of by some writers. Opiates in some form may be necessary for the relief of pain. If this treatment fails to give relief or the disease runs a very acute and protracted course in spite of the treatment, the question of interrupting the pregnancy or surgical intervention on the affected kidney

will come up. In many cases nature will decide the question herself by bringing on a spontaneous abortion. In the other cases most obstetricians will decide in favor of artificial interruption rather than to a nephrotomy. Still there are cases in which drainage of the kidney would be indicated, such as cases of pyonephrosis.

Barth makes a strong plea in favor of nephrotomy. He reports a couple of cases and the pregnancy progressed to term, the labor and puerperium were normal, the urinary fistula in the loin closing a short time after delivery. In other cases he is in favor of inserting a catheter into the ureter of the affected side so as to give free drainage to the pus. He treated a few cases in this way with happy results. He is opposed, and rightly I think, to irrigating the pelvis of the kidney through a urethral catheter. One of our cases (Case IX) in Mount Sinai Hospital had been treated in this manner before being transferred to our service for induction of labor. After she had been discharged from the hospital she had an acute attack necessitating her readmission. She was then operated upon and a large collection of pus was found in the ureter. Whether the attempt to irrigate the pelvis of the kidney contributed to this result it is difficult to say, but it certainly did not benefit the patient.

Pasteau (31), and other French authors speak highly of the beneficial effect of distending the bladder with some bland fluid. This, they assert, excites reflexly contractions of the ureter and favor the expulsion of any pus collections. Personally I have had no experience with this method of treatment.

Case I.—A primigravida seen in consultation with Dr. F. Lange. The patient was near term. Had been treated for cystitis in Philadelphia for six weeks before coming to this city. When first seen by Dr. Lange was very ill and had distinct signs of double pyelitis. He cut down upon one kidney and gave exit to a moderate amount of pus from the pelvis. The symptoms not improving and the condition of the patient being desperate, he cut down upon the other kidney and found a similar collection of pus. The patient only grew worse and she died a few days later undelivered. When I was called to see the case the patient was almost moribund, and the object of my being called was to determine the advisibility of doing a post-mortem Cesarean section. There was a history of gonorrheal infection shortly after marriage, from which time the pregnancy dated.

CASE II.—Mrs. X., aged twenty-two, when in the sixth month of her first pregnancy was taken ill with vague symptoms referable to the stomach, the most pronounced of which was pain at the epigastrium. These symptoms continued for some days before any renal symptoms developed. As this was in 1898, before pyelitis in pregnancy was so well known, a diagnosis of acute nephritis of pregnancy was first made. But the temperature persisted, and as the albuminuria was very moderate and the amount of pus in the urine quite considerable, it was changed to that of pyelitis. The patient was very impatient and several consultants were called. Finally it was decided to empty the uterus. This was done and in a few days the pain and the temperature disappeared. The pyuria persisted for several months. The patient went through two subsequent pregnancies without any recurrence of the pyelitis.

CASE III.—Mrs. M., seen September 10, 1904, in consultation with Dr. Chas. F. Snyder, at Madison, N. J. She was thirty-six years old, married eleven years, had four children, last child four years ago, and was now pregnant five months. August 25, she began to suffer with painful and frequent micturition and considerable pain in the region of the left ureter and over the bladder. The urine was cloudy, contained a trace of albumin, considerable pus and epithelia, but casts were not present. Temperature ranged from 98.3° to 100.4°, pulse 90 to 110. During this period she had several chills and chilly sensations. When seen by me the patient looked and behaved like a very sick woman. There was some tenderness over the region of the left kidney. A cystoscopic examination was negative. In view of her tubercular history, her general condition and that there was no improvement under rest in bed, milk diet and urinary antisepsis, I dvised emptying the uterus if the patient did not improve in a few days. This was done September 15, six days later. Improvement set in promptly after this. The pyuria persisted for some time after. October 29, 1904, the following report was obtained from the laboratory of Reed and Carnick, Jersey City: "Urine pale yellow, slightly acid, specific gravity 1013.51 ounces in twenty-four hours, albumen negative, urea 2½ grains to the ounce, free pus and in clumps, leucocytes squamous pavement epithelia and medium and small, round epithelia. I learned subsequently that the pyuria finally disappeared entirely.

CASE IV.—Mrs. K., seen in consultation with Dr. E. Libman,

June 24, 1903. She was twenty-one years of age, married seven months, and her last menses occurred December 7 to 12, 1903. Two months before she had frequent and burning micturition, which was quickly relieved by treatment. Four weeks before she had an attack resembling grip with pain between the shoulders, and there was a suspicion of dry pleurisy. Ten days before I saw her she began to sufler with pain in the right lumbar region. This was preceded by painful and frequent micturition. June 25, the patient began to have chills. Temperature during the preceding days as follow:

June 21, Temp.,	98.4°–100.4°	pulse, 88– 98.
June 22, Temp.,	98.8°– 99.4°	pulse, 84– 92.
June 23, Temp.,	99.6°–100.2°	pulse, 76– 96.
June 24, Temp.,	99.2°–102.5°	pulse, 87–120.
June 25, Temp.,	100.4°–104.6°	pulse, 100–122.

During this time had attacks of severe pain in the right lumbar region and there was marked tenderness on deep pressure over the kidney, but no enlargement of it could be detected. June 26, had severe chill and temperature rose to 104.5°. June 27, another severe chill lasting forty-five minutes. Temperature 105°, pulse 120. Dr. Libman who had repeatedly examined the urine found large quantities of pus and numerous colon bacilli, no streptococci nor gonococci. June 28, condition about the same. Having some uterine contractions since last night, cervix dilated to about the size of a fifty-cent piece. It was evident spontaneous abortion had set in and it was deemed advisable to assist nature in her efforts, consequently a Barnes dilating bag was inserted into the cervix. June 29, 3 P. M. Patient expelled a premature fetus, probably about six and one-half months, which lived 24 hours. After this the symptoms gradually subsided, there was no further recurrence of the chills and the temperature fell to the normal in four days. The pyuria persisted in diminishing amounts for several months. The patient conceived again December, 1905, was delivered at full term September 18, 1906. The entire pregnancy, labor and puerperium were without incident. Urinary symptoms were not present at any time. The patient occasionally suffered from frequent micturition attended with some burning, but the urine contained no abnormal elements, and the symptoms yielded readily under appropriate treatment.

CASE V.—Mrs. G. F., aged thirty-three years, married twelve years, four children, last child two years ago, six years ago had an attack of hemoptysis and T. B. were found in the sputum. The pulmonary symptoms persisted for about a year. Since then takes cold easily and has frequent attacks of cough but no T. B. has been found in the sputum. April 24, 1905. Is now in her seventh month of pregnancy, says when three months pregnant began to suffer with pain in the right side of the abdomen radiating to the right lumbar region and down to the vulva. The pain was very severe for about a week and during that time suffered from frequent and painful micturition. Does not know whether she had any fever. During the first three or four months of her present] pregnancy she] says she had daily chills (Sic). For the week prior to my seeing her she had some fever and had to remain in bed. During this time had severe pain in the right lumbar region which was relieved by the frequent administration of morphia. Present condition, considerably emaciated, hypersensitive, calls out with pain when any part of the abdomen is touched. But the tenderness over the right kidney is marked and unmistakable. Also marked tenderness on pressure in the right iliac fossa. No tenderness over the "McBurney point." On vaginal examination complains of pain when any part of the anterior vaginal vault is touched. No appreciable thickening detected of the right ureter. Urine, acid, specific gravity 1006, trace of albumin, large number of pus cells and epithelia, occasional red blood-corpuscles, numerous bacteria,] no T. B. and no casts. Patient placed upon proper diet regimen instructed to lie on her left side, an ice-bag over the right kidney and urotropin grains X very four hours administered. May 2. For the preceding eight days symptoms have been growing worse, temperature ranging from 101° to 103°. Pulse constantly rapid, 120 to 130. Pain in right lumbar region very severe and not relieved even by liberal doses of morphine hypodermatically. In view of her tubercular history and from the fear that she would become addicted to morphia, it was decided to empty the uterus. May 3, delivered of a female child of about 7 months which lived for 6 hours. After this the pain in the right lumbar region and along the course of the right ureter subsided as if by magic and the fever rapidly fell to the normal. It was several months before the pus in the urine entirely disappeared. Subsequent to the delivery the right ureter was catheterized to determine whether the process in the kidney was tubercular, but no evi-

dences of that condition were found. The tubsequent good health of the patient confirmed this finding.

CASE VI.—I. F., aged twenty-five years, married one year. In the sixth month of her first pregnancy was seized suddenly with pain in the right lower quadrant of the abdomen, which was not radiating. The pain was so severe that she was forced to go to bed. Three days later had a chill followed by fever. Had moderate frequency of micturition which was attended with slight burning sensation and some tenesmus. I was called to see her on the seventh day of her illness, the medical attendant having made the diagnosis of acute appendicitis. On a careful examination by me this disease was excluded. As there was marked tenderness on deep pressure over the region of the right kidneys, a probable diagnosis of pyelitis was made, which an examination of the urine confirmed. The report of the urine was a follows: "Urine cloudy, specific gravity 1021, alkaline, albumin faint trace, many pus cells, moderate number of epithelia." She was admitted into Mount Sinai Hospital, where she rapidly improved under the usual treatment. Discharged a week later, being practically well, although the urine still contained a moderate amount of pus. I learned afterwards that she went to term, gave birth to a healthy child and that the labor and puerperium were normal. Subsequent fate unknown.

CASE VII.—Mrs. F., aged thirty, had three children. Began to suffer with severe pain in the region of the right kidney in the third month of her pregnancy (fourth). Urine was acid, had a trace of albumin, many pus cells and moderate number of epithelia. There was marked tenderness over the right kidney. As the patient's general health was poor and as she showed no sign of improvement after two weeks of appropriate treatment, it was decided to emply the uterus. The fever course ran from 100° to 101°. After the artificial miscarriage she improved rapidly, the pus gradually disappearing from the urine. She has enjoyed good health since, now a period of two years.

CASE VIII.—R. B., aged twenty, married ten months, first pregnancy. When four and a half months pregnant was seized with chills, high fever and pain in the right loin. Had frequent micturition and says the urine contained blood. After illness had continued for about three weeks she was admitted to the second Surgical Division of Mount Sinai Hospital. The treatment consisted in rest in bed, milk diet, urotropin and opiates to allay the pain which was very severe. A couple of attempts were made

to irrigate the pelvis of the kidney with weak solutions of nitrate of silver. Her temperature had ranged from 98.4 to 104.5, pulse from 88 to 116. Not improving after a week she was transferred to the second Gynecological Division of the hospital. This was on October 1. On the same day steps were taken to induce labor. October 3, expelled a fetus of about six and a half months. On the following day she had a rise of temperature to 104°, pulse 120. After this the fever gradually disappeared and remained normal after October 6. She was discharged October 19. The urine at that time was clear, had a specific gravity of 1020, was acid, had a faint trace of albumin and contained a moderate number of pus cells and epithelia.

CASE IX.—R. H., aged twenty-five years, had one child four years ago and a premature birth at six months two years ago. Admitted into Mount Sinai Hospital, November 1, 1906. For the past month she stated she had pain in the abdomen and small of the back. Micturition was very frequent and very painful. Her temperature was 98° in the morning and 102 in the evening, pulse 98 to 112. There was decided tenderness over the right kidney. Urine acid, 1020, faint trace of albumin, several epithelia and numerous pus cells. The symptoms rapidly improved under the usual treatment. November 6, temperature normal. November 9, patient discharged. Urine still contained a moderate quantity of pus. Further fate unknown.

PUERPERAL PYELITIS.

CASE X.—Mrs. H., aged thirty, married seven years, passed through an acute attack of gonorrheal cystitis, January, 1905. The urine at first was bloody and contained gonococci. Under appropriate treatment the attack subsided and the urine became normal. In November of the same year she conceived for the first time. Her pregnancy ran a normal course, and only once, during July, she suffered for a short time from frequent micturition. This was readily relieved by a few bladder irrigations. Repeated examinations of the urine during the entire pregnancy were attended with negative results. Her labor was at term and quite normal. The puerperium was perfectly normal in every respect until the twelfth day, when she was seized with a chill followed by fever (103°) and pain in the left lumbar region. The lochia had practically ceased, the uterus was well involuted and no exudate nor thickening was found in the pelvis. There was decided tenderness over the left kidney which appeared to be

slightly enlarged. The urine was acid, specific gravity 1010, after standing a heavy deposit formed which under the microscope proved to be chiefly to be made up of pus cells with a moderate number of caudate epithelia and numerous bacteria, the nature of which could not positively be determined. The attack lasted about fourteen days, fever curve ranging from 98° to 102°, and the sediment of pus varying in depth with almost every specimen voided. At no time could gonococci be found in the urine. The pus gradually disappeared from the urine and the patient has remained in very good health since, excepting that occasionally she suffers from an increased frequency of micturition.

CASE XI.—Mrs. L., wife of a physician, twenty-four years old, was delivered two weeks before I had seen her. Her labor was normal and so was the puerperium until the 8th day when she was seized with a chill which was followed by rather high fever (102°–104°). She had severe pain in the right side of the abdomen which radiated toward the right border of the ribs. Bimanual examination was negative. There was no rigidity of the abdominal muscles, though there was a certain degree of tenderness over the whole right half of the abdomen. There was some tenderness over the right kidney on deep pressure. Even before obtaining a report of the urine I surmised that we had to deal with an acute pyelitis of the puerperium and not with acute appendicitis, as her husband and some of his medical friends had diagnosticated. The urine showed a fair quantity of pus with epithelia and numerous undetermined bacteria. On the strength of the condition of the urine and the physical signs I felt fairly convinced of the correctness of my diagnosis. But I had great difficulty in convincing the doctor who was very insistent that an operation for acute appendicitis should be performed upon his wife. The attack lasted about two weeks, after which the patient made a very satisfactory recovery and has remained in good health up to the present time—a period of four years.

PYURIA WITHOUT FEVER.

CASE XII.—Mrs. J., aged twenty-three years, married eighteen months, had a very bad tubercular family history. She herself had suspicious symptoms of pulmonary tuberculosis for the winter prior to her becoming pregnant. Her last menses occurred December 22, 1906. Her pregnancy pursued a nor-

mal course until the beginning of September, 1907, when her family physician notified me that he had found albumin in the urine. The patient, however, was feeling perfectly well, had no pain, no increased frequency of micturition and the rectal temperature was normal. Specimen of urine obtained September 9 was as follows: Total amount in 24 hours 2160 c.c., acid, 1008, marked trace of albumin, urea 1.1 per cent., sediment consists chiefly of numerous epithelia and phosphates, no pus corpuscles. Specimen two days later showed a fair amount of pus cells, no casts, examination for T. B. negative. The specimens were examined every two days and alternately there would be a fair amount of pus and again almost none at all. This condition of affairs persisted until some weeks after delivery, which was normal as was also the puerperium. At no time could any tenderness be elicited on pressure over either kidney. T. B. were repeatedly searched for but could not be found. The patient's general health improved during pregnancy and she has gained in weight since delivery. Apart from the pyuria for about eight weeks she has not had any urinary symptoms.

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