PYELITIS AS A COMPLICATION OF PREGNANCY AND THE PUERPERIUM

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DURING the past year we have had the opportunity of observing a number of cases in which pyelitis complicated the course of pregnancy or of the puerperium. Of late this subject has been studied by many observers, and records go to show that it is of much more frequent occurrence than was formerly supposed. It is a condition which, if not carefully looked for, is easily missed, but which, when the possibility of its presence is recognized, can be diagnosed with the utmost certainty.

To a consideration of some of the points in the ætiology, symptomatology and treatment, I should like to direct your attention, in the hope that we may hear the experiences of those who have had opportunities of observing cases, and that, by calling attention to the frequency of the condition, some help may be given in the recognition of cases which you may be met with in future.

Most of the text-books on obstetrics make but short reference to pyelitis. Yet we have had an opportunity of observing ten cases during the past year at the Toronto General Hospital. These were all fairly severe cases, calling for hospital treatment. There must be a considerable number of minor degree which never reach the hospital wards.

First, as regards the period of onset of symptoms, we have observed cases occurring in the third, fourth, sixth, seventh and eighth months, and post-partum. As a general rule the initial symptoms occur during the latter half of pregnancy, but in some cases before that time.

The nature and the severity of the initial symptoms vary considerably. Sometimes the onset is insidious, sometimes acute. As a rule the first symptom is pain referred to the abdomen, at first not definitely localized, and often accompanied by nausea and vomiting. Bladder symptoms, in the form of frequent and painful micturition, may or may not be present. In my experience they are frequently absent. The temperature is usually raised one or

two degrees, and the pulse rate increased. In some cases the disease is ushered in with a distinct rigor and a temperature of 103° or 104°. Usually in the course of a day or two the pain becomes more definitely localized to one or both renal regions, more usually the right. In other instances the onset is more insidious, beginning with malaise, slight lumbar pain, and slight elevation of temperature. In still others, bladder symptoms may be prominent from the beginning, and a diagnosis of cystitis be made. Later renal symptoms manifest themselves. These may be cases where the infection is an ascending one from the bladder.

At first there may be little or no pus detected in the urine macroscopically, but a microscopic examination practically always reveals the presence of pus cells and of organisms, and these latter can be grown on culture media.

From the beginning there is usually quite distinct renal tenderness, elicited on deep palpation, and this in my experience is a sign on which great reliance can be placed. The kidney is not always distinctly palpable, especially in the acute stages, when the abdominal muscles are sometimes boarded. In the ordinary case there is never any great enlargement of the organ.

On vaginal examination there is usually, but not invariably, distinct tenderness on palpating the bladder through the anterior fornix, and often the ureter on the affected side can be felt as a distinct cord running round the lateral fornix towards the bladder. It is usually distinctly tender.

Cystoscopic examination may reveal the presence of cystitis. The affected side is indicated by the pouting and redness of the corresponding ureteral opening, and by the flow of turbid urine from it. Catheterization of the ureters establishes the diagnosis.

Differential Diagnosis. In the cases with definitely localized renal pain, bladder symptoms and pus in the urine, the diagnosis presents little difficulty. Still, many of those cases have been missed in the past simply from a want of knowledge of the frequency with which the condition is present in pregnancy. In cases where the onset is acute, with severe generalized abdominal pain, nausea and vomiting, distension of the abdomen, high temperature and quick pulse, the differential diagnosis is more difficult. I believe this condition of pyelitis to be so common in pregnancy that when a pregnant woman presents those symptoms it is the first thing I think of, and with this in mind it is usually possible to make a definite diagnosis from other acute abdominal conditions. Many such cases have been diagnosed in the past as appendicitis,

perforated gastric ulcer, intestinal obstruction, empyema of the gall-bladder, and so forth, and operations undertaken without, of course, any relief. A patient with pyelitis has not the typical abdominal look, with drawn face and anxious expression, which is so constantly present in those other conditions. A careful examination of the abdomen will show the tenderness to be most marked in the renal region, so that it can be elicited by pressure from behind over the lower ribs. Examination of a catheter specimen of urine reveals the presence of pus cells and of organisms, usually B. coli. Careful inquiry into the nature of the pain often elicits the fact that it tends to radiate downward towards the urethral orifice. If there is still doubt a careful cystoscopic and ureteral examination will usually clear the matter up.

In most of those acute cases there is a distinct leucocytosis. In my own series it varied from 10,800 to 18,000; and this is what is usually met with.

When the case begins acutely with distinct pain in the renal region, often increased on deep inspiration, the condition has to be differentiated from a pleurisy or pneumonia. This may not be easy in the initial stages, but usually in the course of twenty-four or forty-eight hours it can be recognized. What may be termed the chronic cases, with somewhat indefinite lumbar pain, slight elevations of temperature and general malaise, may be easily missed unless a careful palpation of the renal region be carried out, and a microscopical and bacteriological examination of the urine made.

When the condition arises in the puerperium a differential diagnosis from other forms of bacterial invasion must be made.

Before saying something about treatment let us look for a little at the explanations offered to account for the frequency of pyelitis as a complication of pregnancy. The connexion between pyelitis and pregnancy was first pointed out by Bayer. It is, of course, not a disease peculiar to pregnancy, but pregnancy appears to be in some way or other a determining factor in its production and various theories have been advanced to account for this. In the first place we must remember that pyelitis is more frequent in the female than in the male, and this applies to children as well as to adults, as pointed out by John Thompson and others. We also know, from clinical experience, that cystitis is much commoner in the female than in the male. This is due to the shortness and the large size of the lumen of the female urethra, and to its proximity to an area whence B. coli can readily reach it. This organism has been demonstrated in the urine of women with no symptoms of

cystitis. Leith-Murray, Williams and Wallace found coliform organisms in one-third of normal female urines. The specimens were obtained by intraperitoneal puncture of the bladder, thus avoiding urethral contamination. In only 2 per cent. of normal cases in men have these organisms been found. Engelhorn examined the urine of thirty-five pregnant women, and found it sterile in only fourteen. In ten only of the twenty-one cases in which it was not sterile were there symptoms of cystitis. Opitz, in a systematic bacteriological examination of one hundred and sixty cases of pregnancy, found bacteria in the urine of two-thirds of them, pyuria in only one-fifth. The commonest organism was the B. coli. Weibel, in an examination of one hundred pregnant women, found in contrast to other writers that the colon bacillus was less often met with in the bladder and urethra than other organisms.

There are thus possibilities of organismal infection of the pelvis of the kidney if ascent of those organisms can occur. It is generally conceded that an ascending infection from bladder to pelvis does in some instances occur, not probably along the mucosa of the ureter, but rather through the lymphatics in its wall. This ascent is favoured by dilatation of the ureter from any cause, and consequent stagnation of urine. Such conditions are found in the course of pregnancy. Post-mortem examination of women dying in the later months of pregnancy shows that in a considerable number there is dilatation of the ureters. Olshausen found it in twenty-five out of thirty-four pregnant women, Lohlein in eight out of thirty-two, Polak in thirty-five out of one hundred and thirty. This dilatation is more common on the right than on the left side, due possibly to the right obliquity of the pregnant uterus, and consequent pressure of the right ureter by its right border. In conjunction with this we find that right-sided is much commoner than left-sided pyelitis.

Dilatation of the ureter and stasis have been demonstrated clinically by means of *x*-ray pictures taken after the injection of collargol into the renal pelvis. Weibel found it in sixty-two out of one hundred pregnant women whom he examined in this way. In thirty-three of these there was obstruction to catheterization: in seven at the ureteral orifice, and in the others in the pelvic portion, within 15 cm. of the bladder. Obstruction may be due to muscular spasm, or to flexing and bending in the course of the ureter, swelling of the mucosa, displacement and bending by the large uterus, dislocation and change in shape of the bladder by the uterus and fœtal head.

But, granting that ureteric dilatation is an ætiological factor in the production of the disease, it does not follow that the infection is always an ascending one from the bladder. Such dilatation, with stagnation of urine, favours the invasion of the kidney and ureter by organisms carried in the blood stream, or conveyed by the lymphatics from other organs, such as the intestine. It is held by many observers that the two latter are the commonest routes of infection. Hess, experimenting on rabbits, found that he could induce a pyelitis by ligation of the ureter, and the introduction of B. coli into the blood stream.

Conditions favouring the invasion of the lymphatics or blood stream by the B. coli during pregnancy are the frequency of obstinate constipation, and very often the lowered resisting power of the patient, owing to a subacute toxæmia. It is not uncommon to find albumin and casts in the urine of those patients. They were present in four of my cases, and in one there was such a degree of toxæmia as to necessitate termination of the pregnancy.

Franke found that animals treated with opium showed coli bacteria in the mesenteric lymphatic glands in four to five days after, although they had not complete intestinal obstruction. He has shown that the lymphatic vessels of the ascending colon and cæcum pass to the capsule of the right kidney. The direction of the current is from the intestine to the kidney. Stahr has found lymphatic connexions from the capsule of the kidney to the kidney itself, so that the connecting chain from the mucous membrane of the large intestine to the kidney substance is complete. The ascending colon has a short mesocolon, which on distension of the intestine is unable to cover its whole circumference, so that its posterior surface has a space free from peritoneal covering. On the left side the descending colon is much more movable, has a longer mesocolon, and when completely distended is still covered by peritoneum, so that on this side the serosa-free surface of the intestine does not lie anywhere upon the kidney, its pelvis or the ureter. The significance of this, the nearness of the cæcum and the more frequent occurrence of pyelitis on the right side has been pointed out by Mirabeau. He found that it is coli infection only which prefers the right side. This, when considered in connexion with the anatomical relations, is in favour of the lymphogenous origin of the condition or of direct transition from the intestine.

Nature of the Infecting Organism. In the great majority of instances the infecting organism is one of the coli group. It was present in all of my cases, in pure culture in eight, associated with

a Gram-positive diplococcus in one, and with a staphylococcus in another. Bacteriological examination of those last two cases showed a pure culture of B. coli in the later stages. Williamson and Barrie described a fatal case where the B. paratyphosus was obtained in pure culture from the right kidney. There were abscesses throughout the kidney cortex, indicating a blood infection. Swift found the B. coli in pure culture in seventeen cases which he examined. Louria, in addition to the B. coli, found staphylococcus albus, streptococcus and gonococcus present in some cases. Von Albeck found the B. coli in pure culture in seventy-six out of ninety-two cases of pregnancy pyelitis. The possibility of a tuberculous infection must of course not be overlooked. In one of my cases the patient was suffering from phthisis, but the infecting organism in the urine was the B. coli. In a case with a considerable amount of pus in the urine the organism is almost certain to be B. coli if the reaction is acid. A pure tuberculous infection will, of course, give the same reaction.

Treatment. Fortunately, although at the onset the symptoms may be very alarming, the condition is usually amendable to medicinal treatment, and only in rare instances does the pregnancy require to be terminated, or the kidney interfered with surgically. There are four main lines along which treatment may be directed: (1) Adminstration of urinary antiseptics; (2) the administration of alkalies in cases of B. coli infection; (3) the use of vaccines; (4) catheterization of the ureter and the flushing out of the pelvis of the kidney, or the application of some germicide to it.

In the cases which I have located good results have followed from the use of one or more of the first three methods. In none have we had to resort to the fourth. In the first instance a urinary antiseptic is usually administered, and I have found urotropin the most effective. From a study of the literature this seems to be a very general experience. It is generally given in doses of 10 grains thrice daily, and may be combined with 20 minims of tincture of hyoscyamus if there is bladder irritation. Meantime a careful examination of the urine is made, its reaction determined, and the organism identified. If the latter is in pure culture a vaccine is made. If the reaction of the urine is acid, and no improvement results from the urotropin, the latter is discontinued, and the administration of potassium citrate begun; 15 grains every four hours are given at first, and this is increased by 5 grains at a time until the urine is alkaline at the time it is voided. In some cases it is necessary to give as much as 30 or 40 grains

every four hours before this can be effected. Usually when alkalinity has been established the patient begins to improve. If not, the autogenous vaccine, which has been prepared, is given, the initial dose being usually 100 millions. This is repeated every four or five days, the subsequent doses being of 200 millions.

I know of no way by which one can tell beforehand which of those three methods is likely to succeed in any particular case and I adopt them simply as a matter of convenience and in order to save time. The only disadvantage of urotropin that I have seen is that it occasionally produces strangury, where previously no bladder symptoms had been present.

If there is not a marked improvement by one or other of those methods a cystoscopic examination ought to be made, and the affected ureter or ureters catheterized. The pelvis of the kidney can then be gently flushed with normal saline or a 1 per cent. solution of silver nitrate, or 25 per cent. argyrol applied. The catheter may be allowed to remain in the ureter for some hours to facilitate drainage.

In all cases the diet should be a bland one, quantities of fluid should be drunk, absolute rest in bed must be enforced, and the semi-prone posture on the side opposite to that affected maintained. Purgatives should be freely given.

It is only after a thorough trial of the preceding methods without result that interrruption of the pregnancy should be considered. When this is resorted to rapid improvement usually follows.

Some cases go on to the production of pyonephrosis and pyelonephritis. In such some operative procedure must be carried out, either incision and drainage or complete removal of the affected organ.

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