

PYELITIS OF PREGNANCY*

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DURING the two year period beginning in October, 1921, and ending in October, 1923, there were thirteen cases of "pyelitis of pregnancy" treated in the wards of the Toronto General Hospital. The use of the ureteral catheter as an aid in the treatment of these cases was introduced and this study was undertaken in an endeavour to correlate the findings and determine the results obtained.

ANALYSIS OF CASES

Age.—Of the thirteen patients, five were twenty years of age or under; four between twenty and twenty-five; three between twenty-six and thirty and one between thirty-six and forty. Nine patients, or 69%, were under twenty-five years of age.

Duration of pregnancy.—This series showed that two were at four months, six at five months, three at six months, one was seven months pregnant and one was eight months. Thus eleven or 85% of these cases occurred during the middle three months of pregnancy.

Previous illnesses.—One patient gave a history of "kidney trouble" at seven years of age. Three cases gave a definite history of constipation and one had not had a movement for ten days previous to admission. Two had had miscarriages; eight were pregnant for the first time; two had had one baby; one had two; one had three; and one had had eight children. Hence pyelitis occurred more often during the first pregnancy.

Symptoms in order of frequency of occurrence:

	Cases	Percentage
Pain	13	100%
Frequency	10	77%
Burning	7	54%
Chills and Fever	7	54%
Vomiting	3	23%
Haematuria	1	8%
Blurring vision	1	8%

All patients complained of a sharp pain in the flank, three in both sides, eight in the right and

two in the left. Pain radiated along the course of the ureter in four cases and three patients complained of a sharp pain in the affected flank on breathing.

Examination.—On examination there was definite tenderness in the costo-muscular angle of the affected side though the kidney could be felt in one case only. Tenderness was accompanied by rigidity in some cases very marked and in others hardly noticeable. The urine in all cases showed pus in varying amounts, was acid in reaction, and albumin was present in all but one. Sugar was absent in all, while red blood cells were found in one case. *B. coli* were found in eleven cases, "bacilli" in one case (probably *B. coli* but it was not determined) and *Staphylococcus aureus* in one. No urine showed tubercle bacilli. White blood counts ranged from 10,000 to 16,000 and one blood culture showed the presence of *Staphylococcus aureus* (case 8). Routine blood cultures were not done. The blood pressure was not increased.

Cystoscopy was done in eleven cases. In one of these (case 2) the catheter engaged in the right ureteral orifice but would not go up. The bladder picture was that of an acute cystitis showing a general oedema and considerable redness more marked in the region of the ureter of the affected side. In a few cases a cloudy efflux of urine could be seen coming from the ureter. In the majority, no obstruction was encountered with the ureteral catheter but five (cases 1, 3, 5, 9, 12) gave a free flow from the kidney as if the catheter had tapped a small reservoir.

Treatment.—All patients were confined to bed, sitting on a gatch frame. An attempt was made with one to have her lie on the side which was free from pain, elevating the foot of the bed and the hips, in an effort to carry the gravid uterus up and over to the opposite side and relieve the pressure on the ureter. This was not successful. Fluid diet was used during the acute stage and later changed to a soft diet with great increase in the fluid intake. Alkalies in large quantities were administered to make the urine alkaline, after which the quantity was decreased, giving sufficient only to keep the alkaline reaction.

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Sodium bicarbonate in doses of a drachm combined with potassium citrate in doses of thirty to forty grains every four hours gave the best results; later, in some cases, the reaction of the urine was suddenly changed to acid in an effort to kill out the organisms; autogenous vaccines were also used.

Ureteral catheterization was done primarily for drainage and secondarily for local treatment. The catheters were allowed to remain "*in situ*" for twenty-four to twenty-eight hours injecting 5% argyrol, 1/1000 silver nitrate or sterile water every four hours. Each time the local antiseptics were used the end of the catheter was plugged for fifteen minutes. Those treated by drainage and sterile water appeared to do just as well as those treated by drainage and the local antiseptics. It was found that the temperature in pyelitis of pregnancy tended to recur every five days as if there were a filling up of the reservoir formed by the dilated ureter and pelvis, and ureteral catheterization was repeated to head off the temperature by draining the infected sac. Severe pain recurring in the affected kidney was looked upon as another indication for repeating ureteral catheterization. Divided functional tests and pyelograms were not done as it was not thought advisable to prolong the patient's examination or incur unnecessary risks.

Results.—In the thirteen cases treated, four had another complication. Two developed jaundice with bile in the urine. An increasing pulse rate with progressive weakness made it necessary to induce labour. One case (6), had acute dilatation of the heart, an enlarged liver, tender left costo-muscular angle with high pulse rate and fever. Labour was induced and the ureteral catheter was not used. It is doubtful if this patient could have undergone cystoscopy or that it would have helped her. Case 8 was a *Staphylococcus aureus* septicæmia which had been present for two weeks previous to admission. This was the only fatal one in the series. It was not a true pyelitis with a *B. coli* infection as found in the other cases but showed multiple abscesses in the kidney substance, the result of the septicæmia.

The early stage of all the true pyelitis cases were treated with varying success by internal medication alone. Some were treated in hospital by this method and later by the ureteral catheter. Nine of varying severity were treated by alkalies and the ureteral catheter with complete relief of symptoms. In none that were uncomplicated

was it necessary to induce labour. The pus decreased markedly but in only one case did the urine become sterile.

Diagnosis.—The determination of the existence of pyelitis was made on the history of pain, associated with tenderness in the costo-muscular angle, rigidity in the flank, urinary symptoms of frequency, pain or burning, and rarely of hæmaturia, with a change in the character of the urine. Examination of the urine in a case with these symptoms usually showed pus, albumin and organisms, most frequently *B. coli*. These facts were sufficient to make a diagnosis of pyelitis in a pregnant woman provided none of the other urinary diseases are suspected such as calculus, renal tuberculosis etc. If convenient an x-ray of the kidney, ureters and bladder should be made to rule out calculus. An important point in the history was always to determine whether there were any urinary symptoms before the commencement of the pregnancy. If there were, one naturally had to look for the cause. The cystoscope and the ureteral catheter were used both to confirm the diagnosis and for treatment, particularly for the relief of symptoms due to urine retained in the ureter and pelvis.

Comments.—In five of these cases one was able to demonstrate clearly the presence of retained urine in the ureters and pelvis. If pyelograms had been taken, there is no doubt that the others as well would have shown considerable dilatation in the pelvis and in the ureters.

Discussion on Cases

The question is asked, when should drainage with the ureteral catheter be done? Treatment by alkalies, rest in bed and fluid diet should be our first plan. The onset of marked tenderness with rigidity and constant pain along the course of the ureter indicate dilatation and retention of urine, chills, fever, and vomiting are signs of toxic absorption, the appearance of any of these symptoms or signs should indicate drainage.

From the findings in this small series of cases one cannot lay down the rule that bile appearing in the urine is an indication for induction of labour. The two patients mentioned were seriously ill and recovered when the uterus was emptied.

Cystoscopy under local anæsthesia in these patients is an unpleasant procedure, but is followed by remarkable results. Undoubtedly the kidney is saved prolonged irritation from the pressure of the retained fluid and possibly is pro-

tected from irreparable damage; so much is this the case that early cystoscopy is recommended and when it is done it will bring about almost always complete disappearance of pain with the relief of distension.

Conclusions

1. Pyelitis of pregnancy is more common in patients twenty-five years and under.
2. It is more common during the middle three months of pregnancy.
3. It occurs more frequently during the first pregnancy.
4. It occurs more often in the right kidney.
5. *Bacillus coli* is the common infecting organism.
6. Residual urine in the ureter and kidney is relieved by an inlying ureteral catheter.

Case Reports

Case 1.—Age twenty. Primipara. History of constipation. Complaining of pain in the back radiating to the front on both sides for one week. This pain is accompanied by chills, fever, vomiting, nycturia and slight burning. Abdomen full, size of five months' pregnancy. Tenderness in both costo-muscular angles which is increased with deep inspiration. Kidneys not palpable. *Cystoscopy*: profuse flow of turbid urine from both sides. Catheters left in for forty-eight hours. Pus and *B. coli* present in large quantities. Pain and tenderness disappeared immediately following drainage of kidney pelves.

Case 2.—Age twenty-two. Primipara; one miscarriage. Complaining of pain in left flank with frequency. Uterus one inch above the umbilicus, tenderness in left costo-muscular angle accompanied by pain on deep breathing. *Cystoscopy*: Catheters to both kidney pelves. Urine from the left kidney turbid, contained much pus and *B. coli* on culture. Right kidney urine was clear and free from pus. All specimens were negative for tubercle bacilli. Tenderness disappeared following drainage by catheter. Discharged with the pain and tenderness gone completely, though a few pus cells were present in the urine.

Case 3.—Age twenty-one. Primipara. Complaining of pain in the right flank which radiated to the groin and down the back. No chills, fever, vomiting or urinary symptoms present. Duration, two days. Two molar teeth decayed. Six and one half months pregnancy, marked tenderness and rigidity in the right loin. Kidney not felt. *Cystoscopy*: "Steady flow from both catheters as if from behind an obstruction" found on passing ureteral catheters. Catheters remained in for forty-eight hours. Lavage of renal pelves carried out every four hours using 5 c.c. 5% argyrol. Temperature remained down after lavage and the pain and tenderness disappeared.

Case 4.—Age twenty-eight. Second pregnancy. Complaining of pain in the right flank, frequency and burning for two months. Blurring of vision had been present for one month. She fell a week before admission and the pain became worse and was accompanied by chills, fever and vomiting; no hæmaturia. She was four and one half months pregnant. Tenderness and rigidity present in the right costo-muscular angle. Very slight tenderness in the left costo-muscular angle. *Cystoscopy*: Catheters passed to both kidneys and both specimens showed pus, *B. coli*, and were negative for tubercle bacilli. Inlying catheters for twenty-four hours. Pain and tenderness disappeared, and temperature remained down. Blood pressure 124.75. W.B.C. 10,000.

Case 5.—Age nineteen. Primipara. Constipation. Typhoid two years ago. Three weeks before admission she had a fall which was followed by frequency, burning, and by pain in the right flank radiating down to the groin. Five months pregnant. Mitral systolic murmur, tenderness in right costo-muscular angle. *Cystoscopy*: Pus and gram negative bacilli in both ureteral specimens. Catheters allowed to remain in eighteen hours, washed with 1:1,000 silver nitrate. Pyelogram, right 13 c.c., left 7 c.c. No treatment given, later catheters to kidneys and left in twenty-four hours carrying on pelvic lavages with 5% argyrol every four hours. Bile appeared in the urine, temperature remained up, patient became jaundiced and labour was induced. Blood pressure 120:70. W.B.C. 12,600. Recovery.

Case 6.—Age eighteen. Primipara. Complaining of pain in the left side just below the ribs; chills, fever, vomiting and frequency. Four and one half months pregnant. Tenderness in left costo-muscular angle. Heart enlarged to right and left, rate 140 per minute. Liver enlarged to 3 cm. below the costal border. *Urine*, acid; 1,012; albumin trace; sugar negative; pus, large amount; *B. coli*; no bile; no casts. *Cystoscopy*: not done. Blood pressure 130:68. W.B.C. 16,400. Blood culture sterile. Hb. 62%. R.B.C. 3,800,000. Induction of labour. Following this the temperature, pulse and respirations came down and remained down.

Case 7.—Eighth pregnancy. Constipation. Complaining of pain in the right flank, frequency and burning for thirteen days. Bowels not open for ten days. Five months pregnant uterus. Tenderness in right costo-muscular angle. *Cystoscopy*: Catheters passed to both kidneys, both washed out and catheters withdrawn. Both kidney specimens showed a few pus cells and *B. coli*. *Cystoscopy* repeated and both catheters left in for drainage and pelvic lavage but were pulled out by the patient. *Urine*, acid; 1,020; albumin present; sugar negative; pus considerable; *B. coli* present; casts none. R.B.C. 4,600,000; W.B.C., 14,200; Hb. 104%; non-protein nitrogen 43 mgms. per 100 c.c. of blood. *Progress*: Patient vomited a good deal, bile appeared in the urine and she was jaundiced. Labour induced. Recovery.

Case 8.—Patient complaining of chills, and pain in the back for two weeks. During this time she had no urinary symptoms but continued at her work. A nasal catarrh was present. Temperature, 103; pulse, 140; respiration, 24. Uterus was up to four inches above umbilicus, eight months' pregnancy. Patient appeared acutely ill and had a good deal of tenderness and rigidity in the right flank and costo-muscular angle. *Urine*; few white blood cells; albumin; no casts. Culture; *Staphylococcus aureus*. Blood culture; *Staphylococcus aureus*. Operation. Exploration of right kidney. A pyæmic kidney found, dull red in colour and containing multiple small abscesses. A nephrotomy was done and considerable pus and blood obtained. The kidney decreased slightly in size. Labour commenced spontaneously, baby born and died. Patient died. *Diagnosis*: Pyæmic kidney.

Case 9.—Age twenty. Primipara. Complaining of pain in the bladder region, frequency and burning for six days. Severe colicky pains had occurred in the right flank coming every twenty minutes and radiating along the course of the right ureter but not into the labia. Chills, fever, headache and nausea were present but no vomiting. Bowels regular. Uterus one and one half inch above umbilicus, tenderness and rigidity in right costo-muscular angle and flank. *Cystoscopy*: Catheter introduced to right kidney pelvis. This did not run even on repeated washings. *Cystoscopy* repeated using a Garceau catheter. There was a very free flow of urine. 128 c.c. collected in four minutes. A few days later Garceau catheter introduced into the right ureter, very free flow until 105 c.c. collected and the urine slowed. Garceau catheter again introduced and 80 c.c. of urine collected before the drops came slowly. Left ureter was not catheterized. *Urine*: bladder and right kidney urine

contained a good deal of pus and *B. coli*. There was also a trace of albumin. *Blood pressure*: 110:68. W.B.C., 16,800. *Progress*: Her pain was relieved each time cystoscopy was done (with exception of first) and she was carried along to term when labour was induced. Third and fourth catheterizations were done on a rising temperature which dropped immediately. The pain in the flank disappeared with relief of the distension.

Case 10.—Age twenty-five. Primipara. Complaining of pain in the right costo-muscular angle; pain on urination has been present for one month. History of constipation. Four months pregnancy, pain and tenderness but no rigidity in the right costo-muscular angle. Right kidney palpable but not enlarged. *Cystoscopy*: Catheter to both kidney pelves. Drainage and lavage of the right for twenty-four hours. Expecting a fifth day rise in temperature a Garceau catheter was introduced to the right kidney pelvis. Specimen collected showed no pus and was sterile on culture. *Urine*: showed no albumin, pus in large quantities, *B. coli* on culture; negative for tubercle bacilli. *Progress*: no pain, tenderness or abnormality until the baby was due in May when pus appeared again in the urine and labour was induced. Recovery.

Case 11.—Third pregnancy; one abortion. Complaining of frequency, pain, burning and hæmaturia present for one week. Pain was present in the right flank which "caught" when she took a breath. Tenderness and rigidity in the right flank and the uterus half way to the umbilicus. *Cystoscopy*: Catheter engaged in the right ureteral orifice but would not go up. *Urine*: contained albumin, pus in large quantities with *B. coli*. Left ure-

teral specimen was negative for pus. No organisms were found on culture. *Progress*: this patient's temperature went from 102.2F to normal in five days and remained down. No further cystoscopy was done.

Case 12.—Age twenty-two. Complaining of pain in the left flank with frequency during the previous four weeks. She had had chills and fever. Six months pregnant. Tenderness in both costo-muscular angles. *Cystoscopy*: Number six ureteral catheters were introduced to both kidney pelves. Oedema and redness about both ureteral orifices. There was a very free flow from both catheters, left, 152 drops per minute, right, eighty-eight drops per minute which continued for twenty minutes. *Urine*: pus and *B. coli* were present in both kidney specimens. *Blood pressure*: 120:80. *Progress*: catheters removed in eighteen hours owing to abdominal pain thought to be due to gas. Two days following catheterization her pain was gone and she left the hospital.

Case 13.—Complaining of pain in the right flank and back for four months, burning during and after urination with some frequency. Pregnancy of six months duration. Uterus slightly above the umbilicus. Great rigidity and tenderness in the right costo-muscular angle. The right kidney was not felt. *Cystoscopy*: Efflux from the right ureter cloudy. Urine collected was cloudy and contained many pus cells, clumps of bacilli and no casts. *Blood pressure*: 108:56. Non-protein nitrogen, 22.5 mgms. per 10 c.c. *Treatment*: catheter inlying in the right ureter and pelvic lavage every two hours. *Progress*: rigidity disappeared in twenty-four hours. Slight tenderness and rigidity remained. Discharged five weeks before confinement.