

COMPLICATIONS ARISING IN THE KIDNEYS AND URETERS FOLLOWING ABDOMINAL OPERATIONS.*

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THE consideration of complications arising in the kidneys and ureters introduces for discussion a subject which is broad and far-reaching. Among the many complications which may follow operations within the abdomen or pelvis there are few, if any, more important and none that occur more frequently or demand more careful consideration than those connected with the urinary tract. In this paper I shall consider the more important phases of the following conditions: Irritation of the kidneys, pyelitis, ligation, and necrosis of the ureter.

Irritation of the Kidneys.—This condition is due to the anesthetic and to the shock of the operation which, by diminishing function in all the emunctories, allows toxins, or waste products, to accumulate within the body, and these, when eliminated, produce irritation of the kidneys. The degree of the irritation is modified by the age and general condition of the patient, the nature of the operation, and by the character and amount of the anesthetic administered. Before a patient is given a general anesthetic the condition of the kidneys should be determined. Unless this precaution is taken many patients with nephritis, and occasionally a patient with a pyelitis, will be given an anesthetic, which in the majority of cases aggravates the lesion, at least temporarily, and in some cases causes collapse from toxemia during the performance of or immediately following the operations, or death a short time after the operations have been completed. Should the patient have nephritis prior to the operation the surgeon must choose the anesthetic which will cause the least disturbance. At the present time the statistics seem to be in favor of ether. Winderlick from his studies found casts in the urine after ether anesthesia in 24.6 per cent. and after chloroform in 34.8 per cent. of the cases.

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The condition is manifested by a diminution in the amount of urine which contains albumin, tube casts, and in some cases a few erythrocytes.

In a paper entitled "A Study of the Urinary Analysis of Operative Cases and the Treatment of Complications Arising from Kidney Insufficiency," I called attention to the importance of recording the total quantity of urine passed in each twenty-four hours and the making of a careful chemical and microscopical examination of specimens taken from the mixed quantity for several consecutive days. This is important because it was found that the urine varied at different periods, and by this method only could a functional diagnosis be made. Following operations it is of the utmost importance that the urine should be measured in order to determine to what extent the kidneys are functioning, and in operations within the pelvis where it is often necessary to place ligatures about the region of the ureters, by considering the amount of urine passed the surgeon is frequently put upon his guard to consider the possibility of an ureter having been ligated, and in other cases where there is an injury to the ureter or to the bladder it may be of some assistance in determining whether or not there is a leakage from the urinary tract. In the study of the urinary analysis of 228 gynecological cases subjected to operation, it was found that of 123 patients upon whom a celiotomy was performed 46, or 37 per cent. of the number, suffered from some change in the kidneys. Kelly, in 200 cases following abdominal operations, found casts in 30, or 15 per cent. From these figures it will be seen that irritation of the kidneys is a common complication following abdominal operations. Fortunately, however, in the majority of cases the condition is transitory, and under appropriate treatment clears up on an average of about six days.

I wish to call attention to the fact that patients who suffer from renal insufficiency often develop symptoms similar to those of peritonitis. The condition, I believe, is due to diminished peristalsis caused by the waste products in the body. This diminution of the peristaltic action allows fermentation to take place which causes distention of the bowels and reflex vomiting the same as is seen in cases of true peritonitis. The condition resembles certain cases of uremia, described by Osler, in which the symptoms are chiefly in the gastrointestinal tract; as soon as the urine indicates that the kidneys are acting normally and the poison has

been eliminated these symptoms disappear. In other cases simulating peritonitis, if free bowel movements be secured and the poison eliminated in this way, the casts and albumin disappear from the urine; and in some of these cases where the irritation of the kidneys is marked considerable difficulty is experienced in securing free bowel movements.

The treatment for irritation of the kidneys following operations is to stimulate the emunctories and to dilute the poison to be eliminated. To accomplish this the patient should be placed between blankets; hot water bags should be applied to the region of the kidneys; salt solution should be given by the bowel every six hours, and liquids and purgatives by the mouth as soon as the stomach is retentive. When the quantity of urine passed is small and casts are numerous, hypodermoclysis should be repeated as often as is necessary to maintain the quantity of urine equal to that passed by the average ether patient.

During the last year all patients who have been subjected to abdominal operations, immediately upon being returned to bed, have been given, unless there was some contraindication, two or three liters of salt solution by the bowel. Since this treatment has been adopted it has been found that the quantity of urine passed in the first twenty-four hours has been decidedly increased, that cases of irritation of the kidneys have been observed less frequently, and that the degree of the irritation has been less marked. I believe the improvement from this treatment is due to the greater dilution of the poison, thus causing less irritation. When a large quantity of salt solution is used it should be introduced into the bowel by a slow, continuous flow, as is obtained by using a fountain syringe elevated only a few inches above the level of the body.

In cases of suppression of urine, besides the treatment mentioned, spartein sulphate in doses of 0.065 to 0.130, as recommended by McGuire, should be given hypodermatically at intervals of four to six hours. In cases of acute suppression due to congestion and edema of the kidneys, decapsulation of the organs may be beneficial.

Pyelitis.—An acute pyelitis, or inflammation of the pelvis of the kidney, is a condition which develops in a few cases after abdominal operations, and is due in the majority of cases to an ascending infection. It may, however, be due to an acute systemic infection, or to the extension of an inflammatory condition in

close proximity to the kidney by contiguity. In order to lessen the frequency of this condition, every precaution should be taken to prevent an infection of the bladder. Some patients are not catheterized after operations and there are apparently no symptoms of a cystitis, yet these patients sometimes develop a pyelitis. It is the rule of most surgeons to have the patients catheterized immediately before operations, and it is probable that infection is carried into the bladder at this time. One of the great problems before us to solve is how to catheterize a patient without infecting the bladder. Until this question is settled patients will have cystitis and pyelitis and will suffer with the distressing symptoms which accompany these conditions.

A pyelitis develops in from one to six weeks after the operation and often begins with a chill, followed by a rise of temperature from 102° F. to 105° F., a rapid, weak pulse, prostration, nausea, headache, and restlessness. The patient complains of pain and discomfort in the region of the kidney. Upon examination the kidney will be found enlarged and tender. The urine at first may be clear, but becomes turbid and usually contains a large quantity of pus, and a number of mucoïd and epithelial cells. The urine as a rule is acid. If it remains any time in the bladder it becomes ammoniacal. When irritability of the bladder is present micturition is usually frequent.

I have seen three cases of acute pyelitis follow operations within the abdomen. One patient who had an operation for an extensive inflammatory condition in the pelvis, with involvement of the vermiform appendix, was extremely ill after the operation, was catheterized for several days, and developed a severe cystitis. The cystitis had practically disappeared and she left the hospital in apparently good condition at the end of four weeks. Two weeks later she was taken with a chill, followed by a rise of temperature to 103° F., and the following day to 105° F. She complained of pain and discomfort in the region of the right kidney and irritability of the bladder, with frequent micturition. Upon examination the kidney was found moderately movable, swollen, and tender. The urine at first was turbid and a few days later was loaded with pus. At the end of three weeks all evidence of the pyelitis had disappeared and there has been no further trouble with the kidney. In the second case the operation was a hysterectomy. The patient was catheterized before and a few times after operation, but at no time were there symp-

toms of a cystitis and the urine was normal. Five weeks after the operation she developed a pyelitis in a freely movable right kidney. The symptoms in this case and in the one to follow were similar to those of the first case and will not be described. The amount of pus in the urine was small at first, but increased greatly in a few days. The patient recovered in about two weeks and has since remained well. She suffers, however, with a dragging sensation in the side, probably due to the movable kidney; the urine has remained free from pus. In the third case the patient developed a pyelitis on the right side two weeks after a simple abdominal operation. She was catheterized immediately before but not after operation. The symptoms cleared up in about ten days and the urine has remained free from pus. At times she suffers with discomfort in the region of the kidney.

The early diagnosis of acute pyelitis is of the utmost importance and as a rule is made without difficulty. The pain and tenderness in the region of the kidney, the marked elevation of temperature, the prostration, and the pus, mucoid, and epithelial cells in the urine should make the diagnosis reasonably certain. If an early diagnosis be made and appropriate treatment instituted, the prognosis should be fairly good. Should a diagnosis be not made, the condition may progress and develop into a pyelonephritis or into an abscess, with destruction of the kidney.

The treatment of acute pyelitis should begin by placing the patient at absolute rest in bed. Icebags should be applied to the region of the kidney. The most important part of the treatment is to flush out the kidney, and this is accomplished by drinking large quantities of water. The amount of pus in the urine increases as soon as the water washes out the kidney, and at this time the high temperature begins to subside. Phenyl salicylate and hexamethylenamine are recommended and usually used, but their value is doubtful. The improvement is due largely to the rest in bed and to the large quantity of water. The prostration in these cases is usually marked and the patients should be given supporting treatment and appropriate diet. The bladder should be irrigated daily with a solution of boric acid followed on alternate days by a solution of one of the silver salts. This is for two purposes: 1, To cure the cystitis which is usually present; and 2, as a prophylactic for the other kidney. When the symptoms progress under medical treatment the kidney should be incised and drained.

Ligation of ureter.—During operation for intraligamentous tumors, for inflammatory conditions with extensive adhesions, and more especially for carcinoma, the ureter may be ligated. This can usually be avoided by placing the ligatures close to the side of the uterus. When it is necessary to place ligatures in the immediate neighborhood of the ureters the accident can be avoided if the ureters be found at the brim of the pelvis and followed down to their entrance into the bladder. In tracing an ureter it is better to push the tissues away from the ureter and not the ureter away from the tissues, as care must be taken to preserve the periureteral arterial plexus and also the ureteral sheath.

The sudden blocking of a ureter, as by a ligature, usually produces agonizing pain along its course, extending into the kidney, accompanied by restlessness, a hot, dry skin, fever, rapid, weak pulse, and diminution of urine. When such symptoms are present following an operation within the abdomen or pelvis there should be little doubt as to the true nature of the trouble. In cases where the diagnosis is not certain, the inability to pass the ureteral catheter except for a short distance, and the failure of urine to pass through the catheter, should settle all doubt as to the true condition. Should both ureters be ligated the symptoms will be bilateral and there will be anuria. Occasionally the ligation of an ureter will be followed by no symptoms, and in such a case the accident will probably not be discovered. Noble reported a case in which the ligation of an ureter was followed by no symptoms. The accident was discovered at autopsy.

Should a ureter be severely injured during an operation and the condition of the patient such that time cannot be taken to repair the damage, it may be ligated without serious harm to the patient, providing the other kidney is normal. The symptoms on the affected side will soon disappear, as the kidney will become atrophied from backward pressure of the urine. Von Rostorn has deliberately ligated the ureter on several occasions without any disadvantage to the patient, when operating for carcinoma cervicis uteri.

The treatment for ligation of a ureter is to remove the ligature or ligatures.

Necrosis of ureter.—Necrosis of the ureter is a complication which follows in a certain percentage of abdomino-pelvic operations. The condition is most likely to occur in cases of carcinoma

where a wide dissection is made and the ureter is injured or its blood supply disturbed. It may follow when a ligature is passed, by means of a sharp needle, through the side of the ureter, when the ureter is accidentally crushed in the bite of a clamp, or when cooked by the electrothermic clamp. Noble reported ten cases of panhysterectomy in which the electrothermic clamp was used. In three cases, 33.3 per cent., the operations were followed by fistulæ, all of which healed spontaneously in two and a half, five, and nine months respectively.

Sampson, from his experiments on the blood supply of the ureter, found that the ureter could be freed throughout its length, from bladder to kidney, and that a necrosis would not follow providing the periureteral arterial plexus was not injured. Wertheim states that in his radical abdominal operation for carcinoma cervicis uteri the lower pelvic portion of the ureter should not be separated from the tissues along its outer side. By following this technique there was only one case of necrosis of the ureter in his last fifty radical abdominal operations for carcinoma cervicis uteri. Before this precaution was taken he had five cases of necrosis following thirty radical operations.

Nearly all cases of necrosis follow operations for carcinoma and are situated near the distal end of the ureter, and result in uretero-vaginal fistulæ. In cases of intraligamentous tumors and extensive inflammatory conditions, where the ureter is injured higher up, the accident is usually discovered and the ureter repaired at time of operation.

The time at which the leakage from the lower end of the ureter begins will depend upon the nature and the extent of the injury. The diminished amount of urine passing through the bladder and the leakage of urine from the vagina should make the diagnosis easy. On the other hand, the diagnosis of the exact location of the fistula is usually difficult. Should the leakage take place within the peritoneal cavity the signs of ascites would develop with or without the symptoms of a peritonitis, depending upon whether or not the urine was sterile. In such a case the amount of urine passed would be diminished and the distention of the abdomen would be progressive. Quick reported a case of traumatic rupture of the bladder in which all the urine leaked into the peritoneal cavity. At operation, eleven days after the accident, there was no evidence of peritonitis.

In cases of necrosis, where the fistulæ do not heal sponta-

neously, after the exudate is absorbed from the pelvis, an operation should be undertaken to remedy the defect. In some cases the continuity of the ureter may be restored by a plastic operation. In other cases it will be necessary to make a uretero-vesical anastomosis. In injuries low down in the pelvis a uretero-ureteral anastomosis is practically an impossibility. Should the ureter be injured higher up and a uretero-vesical anastomosis cannot be made without considerable tension, a trans-uretero-ureteral anastomosis, as suggested by Kelly and McMonagle, and performed experimentally upon dogs by Sharp, may be considered. When none of these procedures are practicable, as a last resort the ureter may be ligated or a nephrectomy performed. In no case should either of these last two procedures be carried out until it is known that the patient has a second kidney and until after the condition of the second kidney has been determined.

In closing I wish to state that I believe if the condition of the kidneys were studied more carefully prior to the operation, and if the ureters received more consideration during the time of the operation, there would be fewer complications to deal with.

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