Section of Urology

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A Consideration of Uretero-Colic Union and Some Experiences in the Operation

PRESIDENT'S ADDRESS

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THE EVOLUTION OF URETERO-COLIC UNION

THIS procedure is not yet standardized and some allusion to its evolution may be interesting. Surgical attention was at first mainly focused on the valvular junction of the ureters with the bladder. This was thought to have a major rôle in preventing the ascent of sepsis to the kidneys and, accordingly, Maydl in 1896 transplanted the ureteric ends "en bloc" with the trigone into the rectum. G. R. Fowler (1898) pointed out that Maydl's method was fallacious because the efficacy of the uretero-vesical valve depends on the rise of tension in a closed cavity by contents pressing constantly on its walls, a condition

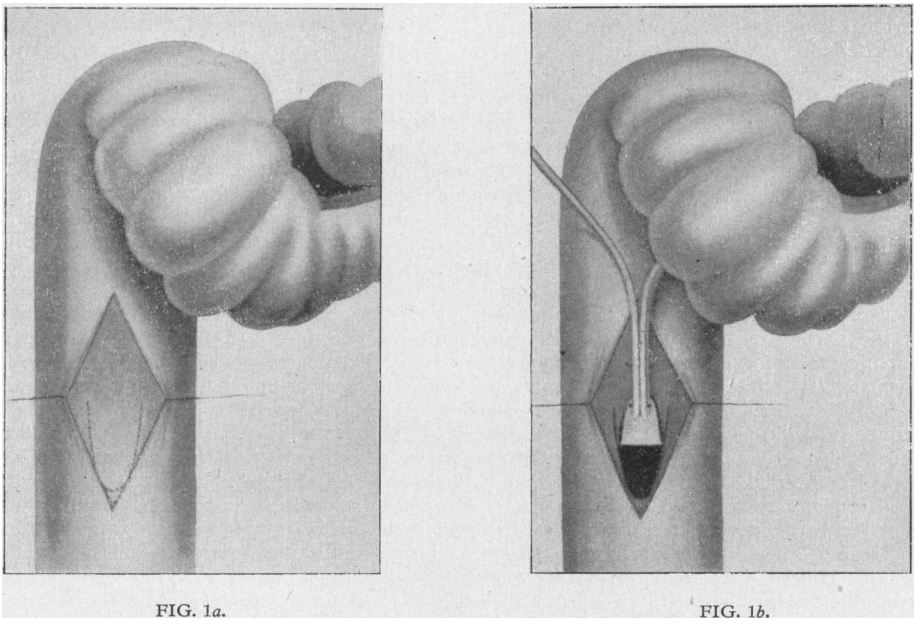

FIG. 1*a*. FIG. 1*b*.

FIG. 1.—Implantation of ureters, after Fowler, 1898 (*Amer. J. med. Sci.*, **115**, 274).
(*a*) Incision on anterior wall of the rectum, including serous and muscular coats. Mucous membrane exposed in a diamond-shaped area, and the edges of the incision retracted by thread retractors. The dotted line shows line of section of mucous membrane to form the tongue-shaped flap.
(*b*) Tongue-shaped flap cut, turned up, and laid upon itself (doubled back). The ureters are placed with their obliquely cut ends lying upon the surface of the flap and secured by catgut sutures in the space in the upper half of the diamond.

which prevails in the bladder but is wanting in the colon. Instead, he preferred the manœuvre invented about the same time by Krynski (1895) who laid the ureter between the mucosal and muscular layers prior to opening into the bowel lumen and so effected a valvular insertion of the ureter. Krynski cured a man with ectopia vesicæ thus and the patient was well eight months later. Fowler sought to improve on this by adding a flap of rectal mucosa to shield the ureteric orifices (fig. 1*a* and *b*). Stress is laid on this

original operation of 1896 recently by R. S. Fowler (1943), who quotes: "Placing the ureters in the submucous space of the rectal wall for a distance of three or more centimetres about the point where these enter the cavity of the rectum affords an additional safeguard against renal infection." He (G. R. F.) reported the satisfactory state of his patient a few years later; but his procedure, like that of Maydl, failed to find favour among surgeons. The fear of renal pollution still dominated the medical mind until the description by Grey Turner (1929) of a large group of successes roused the hopes and expectations of the most sceptical. He had been using Stiles' (1911) method of union after the fashion of a Witzel's gastrostomy. In the interim Coffey (1921, 1928) published his method, which virtually was a slight variant of the Krynski principle and he developed the use of an indwelling ureteric catheter. But careful analysis casts some doubt on the competence of this barrier for, presumably, in the bowel wall the ureter is only flattened out momentarily as pressure rises with peristalsis squeezing fæces past the site; whereas into its patulous mouth fluid matter of the resting bowel may pass readily. The mucosal flap over the ureteric orifices devised by Fowler as a fæcal guard is ingenious, but somewhat theoretical. The situation may, nevertheless, not be as hopeless as this criticism suggests, for, still fashioning a simple union, Grey Turner (1943) reports diminishing incidence of ascending renal sepsis. Nature, too, offers further deterrents to ascending infection, viz. the regular flushing of urine in the reverse direction, as well as contraction of the ureter by its own peristalsis. Fowler (R. S.) quotes from Dr. Vaper Branch in 1912, ". . . that reflux is prevented much more by the ureter itself than by the obliquity of its valve". Certainly the incidence of renal infection does not appear proportional to the degree of dilatation of the ureters prior to transplantation. Sir Henry Wade (1939) advocated simultaneous bilateral transplant. He relies on the routine transfusion of isotonic sod. sulph. to prevent anuria and, by flushing the ureters, to stem the ascent of fæcal sepsis.

Urinary obstruction.—Other dangers have declared themselves and engaged much surgical thought and experimentation. Not only is ascent of fæcal infection to be feared but the reverse, namely, impeded down-flow of urine. This may occur early from unduly tight stitching of the bowel wall, when burying the ureter, or from subsequent œdema. Later, stenosis may ensue owing to infection and necrosis of the ureteric end with subsequent granulation and scarring. I have endeavoured to contend with these risks by following Grey Turner's lead. He warmly advocates simplicity in technique and relies on gentleness and tactful stitching, whereas others, notably Coffey and recently Wharton (1942), preserve patency by an indwelling catheter in the ureter when stitching the bowel over it. The elaborate technique of the Coffey procedure contrasts sharply with the simplicity of Grey Turner's operation. Urinary obstruction is also liable from angulation and kinking of a redundant ureter as it approaches the colon; but equally dangerous would be tension or drag of the sigmoid loop on the junction. To meet with both these contingencies I surround the colon by four stitches which tie it to the upper end of the opening of the parietal peritoneum through which the ureter is brought. Any excess ureter finds harmless accommodation retroperitoneally where, in the course of routine pyelography, surprising bends and loops are sometimes seen and compatible with satisfactory function.

Blood supply.—Some allusion is merited to the blood reaching the free end of a long length of isolated ureter. Here the evidence of Hinman and Weyrauch (1942) is valuable, that "the end often sloughs level with the rectal mucosa, though not proximal unless in instances of massive necrosis. A cross circulation from the intestine lends added vitality to the ureter soon after the first week". Operation provides a practical test and suggests that, as little blood oozes from the raw ends, the circulation is somewhat precarious in the adult. It is well to remember that Stiles was reporting operations on infants when he wrote "the ureters possess such a rich blood supply that the danger of necrosis is probably no greater with the latter (Witzel) than with the former (Maydl) procedure". A feeble circulation is helped by gentle handling aided by parietal relaxation of spinal anæsthesia, which I routinely use, the elimination of indwelling catheters that might press on delicate vessels, and tactful stitching of colon when embedding the ureters. The patient's general circulatory tone is best supported by minimum interference with normal activities. In the ordinary patient an enema on the day prior to operation assures absence of fæcal accumulation. More prolonged preparation is needed in the constipated.

Earlier operation in infancy.—Thus there emerge three chief objectives in the operation —secure fusion of the tubes, a pervious passage through the ureter and its adequate blood supply. At this juncture it is appropriate to allude to what is quite unorthodox teaching by Higgins (1943) who, using the Coffey method and fusing one ureter at a time, advocates operating on cases of congenital vesical incontinence in the first year instead of waiting till the child is five. His reasons are clearly set forth and make a strong appeal. He emphasizes the high death-rate from renal infection early in the life of the unoperated

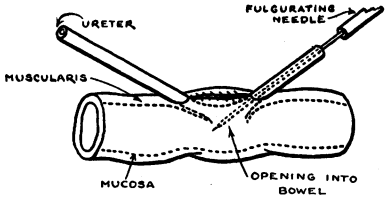

FIG. 2*a*.

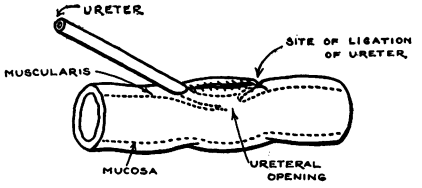

FIG. 2*b*.

FIG. 2 (*a* and *b*).—Experimental transplantation of the ureters, after Ferguson (*Military Surgeon*, 1931, **69**, 184).

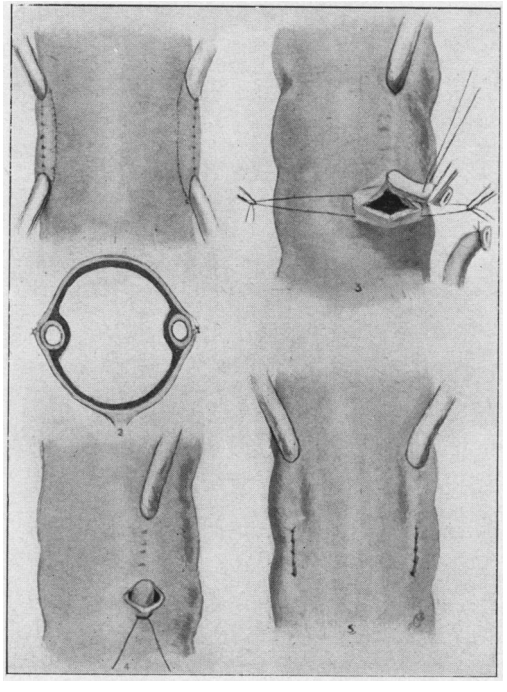

FIG. 3*a*.—Technique, after Winsbury-White, 1933 (*Proc. R. Soc. Med.*, **26**, 1215).

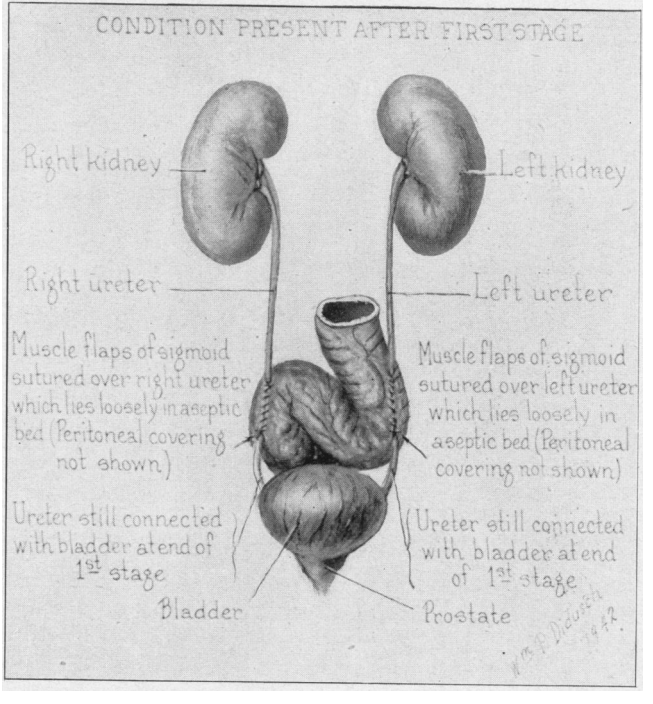

FIG. 3*b*.—Technique, after Jewett, 1942 (*J. Urol.*, **48**, 497).

and the exclusion of this cause of failure by intervening before the wonderful potentialities of the circulation in the early months of life are lost. In support of this claim is the astonishing successful healing that follows other operations on the most puny infants in the early weeks of life, e.g. for intestinal obstruction, jaundice and, even, a 1½ lb. nephrectomy on a child of 10 weeks (Adams, 1937), who is now a bonny girl.

Widening Field of Operation

So much for the operation to cure the life-long misery of congenital incontinence. Deviation of the urine is, however, being practised for an increasing variety of ills and even in late adult life. Of course such operations carry with them great risks. For instance, the transfer of his urine to the colonic receptacle in the sickly subject of vesical cancer is certainly a hazardous undertaking and the results of Coffey's operation, collected in 1939 by Hinman (1939), are daunting—a mortality of about 50% in 132 such cases! From their earlier brilliant successes Morson and Graham (1940) describe 13 cases of mixed pathology treated by simple technique. They report that their deaths (5) were confined to "advanced malignant disease". B. J. Ward (1936) reports a series of 7 successful cases.

Two-stage operation.—Something more seems needed, and this Ferguson (1931) may have provided by his strategic approach to the problem. He saw that while the new structure was becoming soundly consolidated there was no need to involve it in new function, any more than we tread on concrete till it is dry. He planned the operation in two stages—*form first, function second.* He fused the intact ureters to the colon while leaving the urine still flowing to the bladder. The union having thus become sealed against the access of bowel infection and assured its vitality in the new site, the ureter may then, like a bridge-graft, safely be divided at the distal end, and the lumen of the uriniferous segment be opened into that of the attached colon (fig. 2). His success in the dog was followed by that of Winsbury White (1933) in the human (fig. 3*a*). Substantial experimental support was added by Vermooten (1934) who, referring to the one-stage method, "showed that a conspicuous cause of failure was the immediate accessibility of the freshly opened tissue spaces within the wall of the bowel to the pathogenic bacteria in its lumen. Exudate surrounding the embedded portion of the ureter was almost inevitable. If such animals survive, the organization of this periureteral exudate will produce a mechanical ureteral obstruction, and at the same time reduce the efficiency of the uretero-intestinal valve, or destroy it entirely".

The elaboration of the two-stage fusion in the human has been most thoroughly pursued by Jewett (1942, 1943). A month after bilateral fusion of the uncatheterized ureters to the colon, he applies diathermy by a special electrode to about a centimetre of the septum separating the interiors of the blended tubes, an elaboration of the principle depicted in fig. 2. A total cystectomy is combined with this functional coalescence Great stress is laid on the need for strict alignment of colon and ureter, conspicuous in the illustration, to exclude kinking at the junction of the tubes (fig. 3*b*). He reported his results in 1942 and a further series in 1944. Intestinal adhesions were his chief complication and he gives a detailed description of the most meticulous ritual to avoid their formation. Experience has proved to him that the site of fusion can be steadied adequately by a few stitches uniting the upper and lower ends of the fusion line to the parietes and, dispensing with fixation by extra-peritonization, he has saved adhesions.

Illustrations from the earlier operation of Winsbury White and Jewett's latest technique make an interesting comparison. The former is so much simpler but I have no figures of a series done in that manner. Jewett's latest results in vesical cancer are most encouraging, only one patient having died out of the last ten and that was due to pulmonary metastases. Before closing this review of the history of uretero-colic fusion, two points in Wharton's single-stage modified Coffey operation call for remark. Piercing the colonic mucosa is apt to be an awkward little manœuvre and seems more efficiently done, as he advises, with a cautery. But his main contribution is fixation of the colonic fusion site back to the pelvic wall in such a way that the *ureter lies in its natural bed.* This seems the best insurance of all against strain and kinking.

Peritonitis.—This has figured less in these remarks than might seem due in view of the risks of both urinary and fæcal contamination or post-operative leakage. Doubtless the adhesive type follows in some degree more or less routinely, even after the simplest procedure; but in a grossly suppurative form it is remarkable for its rarity. It is likely to figure more prominently when operating for the relief of urinary cancers or tuberculosis. At the Middlesex Hospital recently, Mr. Riches showed us *retro-peritoneal anastomosis.* He delivered the bowel, then stitched the edge of the opening in the peritoneum around the area planned for ureteric union and to this joined the proximal

ureter. This appeals as a logical means of circumventing risks to the peritoneum, though I have found smooth alignment of the two tubes more difficult. He was content to deal with one ureter only at a session, which may not halve the hazards of healing but must appreciably reduce them; and one intact ureter offers a comfortable degree of life insurance, while a transplant is "taking" on the other side.

Personal Experiences

In relating my own experience of uretero-colic union it seems well to group the cases on a pathological basis. From their discussion will be gleaned indications for the operation, their differential diagnosis, points in technique, after-care and progress.

To the oldest and obvious indication for transplant—ectopia vesicæ—reference has already been made in quoting Higgins' advocacy of earlier operation. My experiences chance to be small and unprofitable to quote; but here I should like to report a much rarer congenital defect—absence of urethra—in F. P., a girl aged 5 years. She had complete incontinence and might have tempted one to resort to ureteric transplantation. Instead I tried a simple plastic closure of the bladder neck and now, two years later, she has achieved good control by day and most nights.

In regard to acquired incontinence, I have one obstetric case to report. E. S., aged 29, came, still incontinent, after four attempts elsewhere to close a vesico-vaginal fistula of two and a half years' duration. The gynæcologist still objected to uretero-colonic anastomosis, fearing kidney sepsis, so I added my plastic effort to those of my predecessors and

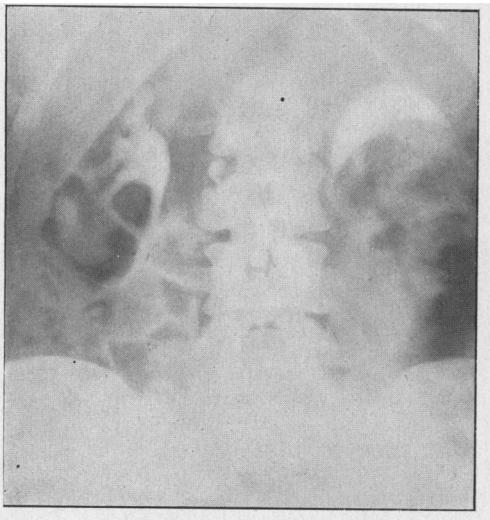

FIG. 4*a*.

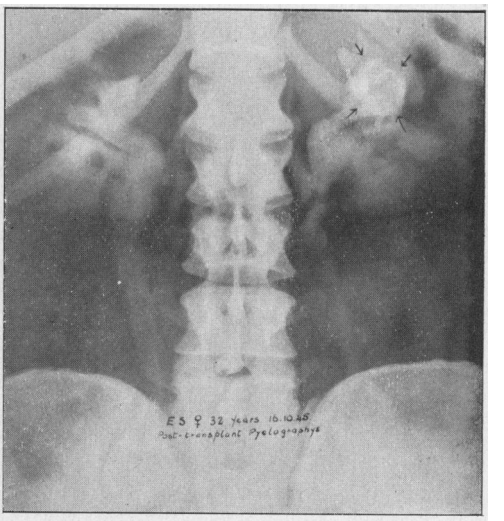

FIG. 4*b*.

FIG. 4 (*a* and *b*).—E. S. Pyelography before (*a*) and after (*b*), uretero-colic union for obstetric fistula.

gained a good exposure in a fat woman by a preliminary removal of pubic bones. The repair of the fistula at the bladder neck seemed promising but, despite this and ureteric catheters remaining for four days, the fistula recurred.

On 21.4.44, after pyelography (fig. 4*a*) and a prescribed loss of three stone in weight, bilateral uretero-colonic anastomosis was done. Total cystectomy cured the prolapsing bladder on 2.6.44. The ureters were of normal size and the method of anastomosis was that used by Grey Turner and by me in most of my cases. Although on full work and urinating three-hourly, her skiagrams now show a stone in her left kidney (fig. 4*b*).

Refractory Ulcerative Cystitis

While the cause of this malady remains obscure, the perpetual agony and often the ostracisms suffered by its victims are painfully obvious and led me to try relief by defunctionating the bladder. Included in this group with four typical female cases are a few males whose complaints were bitter enough but in whom the cystitis is of somewhat obscure pathology.

The first story is that of A. S., aged 29, married. She came in 1942 with severe dysuria and sterile slight hæmaturia. The bladder was ulcerated irregularly in a crescentic zone near the dome. As the urogram portrayed, it was a contracted and intolerant organ even with spinal anæsthesia (fig. 5*a*). The routine simultaneous intra-peritoneal transplant was undertaken in September 1942. Irregular fever, which is not uncommon, followed in her case. There was a suspicion of swelling in both loins and she was troubled by

another frequent post-operative discomfort—that of flatulent distension. This may be relieved by the regular passage of a flatus tube every four hours, which also prevents the accumulation of urine in the bowel during the first few days. When she visited the ward again three months later her much improved aspect disguised her identity from the ward Sister. Despite her clinical well-being, radiography, 10.3.43 (fig. 5*b*), reveals obvious dilatation of ureters and kidneys. The current picture is the same. She remains delighted, at full work and urination is usually only five-hourly and not at night but, with a cold, may be every two hours.

She recently asked: "May I have a child?" Her blood urea is 0·060% and her weight does not increase so I shall warn her of the risk. Many will recall Grey Turner's triumphant picture of a woman with the four children she bore after ureteric transplant.

Since the above was written she has died from a brief attack of uræmia, December 1945. Yet the post-mortem showed a reconstructed urinary system which was apparently satisfactory.

D. G. came first in 1937 at the age of 21. Repeated diathermy to a patch of ulceration in the fundus was ineffectual so, in 1938, I operated. Cystotomy cut the ulcer in twain. It was a discoid lesion, about two centimetres in diameter, raised like a button in the bladder wall the whole thickness of which was excised. The removal appeared complete and the pathologist reported "appearances agree with Hunner's elusive ulcer of the bladder". She resumed full work, looked radiantly healthy and lost her pain and frequency but, contrary to my advice, married in October 1939. Her symptoms at once returned and she became a social outcast. Cystoscopy confirmed the cystitis and healthy urines in the ureteric specimens. Pyelograms in 1937 had been normal but by 1943 showed marked hydro-ureters and renal dilatation. Pain in her loins and, finally, hæmaturia reconciled her to uretero-colic union in February 1943. Faced with mega-ureters I offered her a transplantation of one ureter at a time, but she would only consent to a single intervention. At this operation a technical difficulty declared itself in the

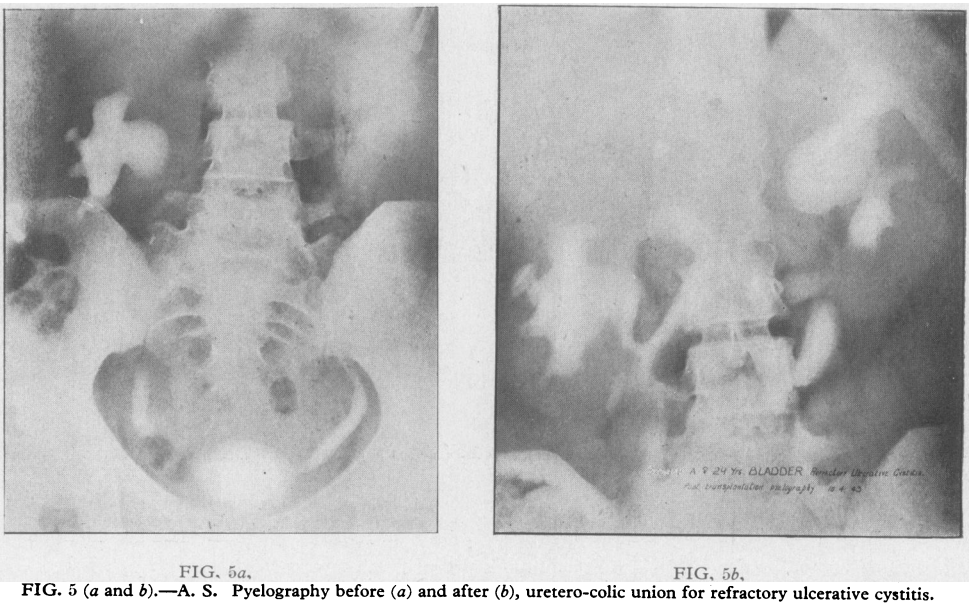

FIG. 5*a*. FIG. 5*b*.

FIG. 5 (*a* and *b*).—A. S. Pyelography before (*a*) and after (*b*), uretero-colic union for refractory ulcerative cystitis.

tendency of a large ureter and the necessary enfolding of the colonic wall to encroach obstructively on the bowel lumen. Her convalescence was an anxious time with recurrent fever, headache, vomiting and pain and foul discharge on lavage of bladder. Urination was satisfactory and only once was tenderness in the right loin present.

The reward for effort came a year later when her husband wrote: "Everyone still cannot believe that my wife is enjoying such good health after suffering so long." In June 1945 urination was three to six times by day and once at night. She had done an ordinary wartime job for a year and was adopting an infant.

F. W., aged 44, told a like story of long, painful and incapacitating illness. Cystitis had already troubled her for two years when first I saw her in 1939, frail in form and voice and with a pale waxen countenance. Irregular ulcerous areas at the back of the bladder increased despite diathermy. It was in her case that one of the excavations was seen oozing blood during cystoscopy and the bladder ruptured into the peritoneum. She survived immediate laparotomy and, indeed, the result was surprising amelioration of symptoms but, later, she deteriorated and consented to the desperate uretero-colic union. This was preceded by pyelography, and precautionary sigmoidoscopy, as diarrhœa also had become a serious worry. The operation was on 9.8.44, and convalescence anxious, but she was gratified with her new "water-works" till terminal pyelonephritis developed this spring and urography showed a calculous cast of the right pelvis. She died on 9.6.45. Post-mortem showed the bladder lining smooth and shiny but the organ otherwise notably

natural despite its eventful history! The right uretero-colic union showed a satisfactory papilla on the bowel lumen but the left ureter ended abruptly and blindly at its junction with the serosa of the colon and had evidently undergone necrosis distal to this point. Function had been suppressed on that side where the ureter was dilated but the kidney unaffected. Obviously she had been living solely on the enlarged right kidney of which the ureter and pelvis were dilated and contained phosphatic aggregations—the source of her skiagraphic opacity—and a little muco-pus. There were merely moderate ileal adhesions to pelvic colon.

Reflection provokes the question, could this patient have been saved by early resort to uretero-colic union?

M. V., aged 24, married. She came in September 1944 with dysuria which had defied diagnosis and relief since causing her discharge from the Army a year before. Hers was a fitful history and started in childhood with urgent urination at inconvenient times. In her late teens nocturnal frequency set in and, in 1938, right renal pain. Later it came on the left and removal of that kidney was advised, but the trouble abated. She "joined up" and went to France in 1940. When urgent micturition recurred in 1943 she was put on her mettle as a case of "nerves". She tried to ignore it and took up cycling, but had to hop over the hedge too often to enjoy it! Micturition became painful and she so ill as to be mostly in bed from July to September 1943. After investigation "M & B" tablets improved her. Relapsing again in 1944 she was sent to me. I diagnosed refractory ulcerative cystitis and, as I foresaw a future of grave suffering and disability, advised diversion of the urine to the colon. The urines from both kidneys were healthy, although obvious hydro-ureter and hydronephrosis were manifest. The crescentic ragged ulceration above the ureteric orifices of a contracted bladder conformed better to refractory ulcerative cystitis than tuberculosis, and repeated search for organisms was negative. In September 1944 the routine transplantation was done of ureters dilated to the calibre of an average pencil. After the initial post-operative setback she made rapid strides and by the fourth week her urine was "clearer than before operation". She thrived well, put on weight and got her desire, joining her husband in West Africa in July 1945.

Among the males, R. P., aged 62, illustrates the efficacious result of unilateral diversion of the ureteric flow. In 1940 he came to me with a story of cystitis for ten years following catheterization for sudden retention. His frequency had become $\frac{D\ 20}{N\ 10}$ and so agonizing that he was thrice found unconscious on the lavatory floor. The urine showed pus, B. coli and streptococci. There was a one-ounce hydronephrosis seen on the right and a normal left pyelogram. Cystoscopy showed a single, terraced, ovoid ulcer, about 2 cm. across, with deep necrotic base. It suggested Fenwick's solitary ulcer in the region of the right ureteric orifice. Guinea-pig tests of urine and a biopsy of the right ureter were negative for tubercle. After a preliminary cutaneous right ureterostomy and excluding cancer by palpation of the exposed thimble bladder, I turned the ureter into the ascending colon. Micturition soon became and remained normal. The intravenous pyelogram, five years later, is fair on the left but no dye is apparent on the right. In this remarkable case a bladder, the site of a refractory ulcer centring on a ureteric orifice and causing intense dysuria, was restored to normal function and the patient to full vigour by diversion of corresponding ureter to colon with consequent defunctionation of that uretero-vesical junction.

F. P., aged 57, is another case of inveterate, intensely painful cystitis but in which transplantation came too late. About the right third of his bladder showed leukoplakia, having a uniform icing-sugar appearance of sharp rounded outline when I first cystoscoped him in 1943. His past history included removal of testicle, which proved to be tuberculous in 1924, and since then pain in the right loin. In 1934 vesical instillation of calomel oil had eased cystitic symptoms till, in 1943, after right renal colic, he passed a small stone and since then pain had recurred. Nothing but a few *B. coli* were found in his urine. Lupus of bladder was considered but guinea-pig innoculation proved negative as did biopsy of the scarred right kidney which I found on exploration. I failed to catheterize the right ureter. Urine from the left was healthy. Pyelograms were fairly dense. By January 1945 there was added to the spectacular leukoplakia, general engorgement and ragged ulceration. Left extra-peritoneal transplant was done as a desperate measure but he died ten days later. The sketch of the specimen (Fig. 6) shows the very interesting ascent of the leukoplakia two inches up the right ureter where, as on the bladder mucosa, its outline was sharply demarcated. That kidney was grossly septic. The left kidney and ureter appeared clean, except at the anastomic level where the lining was sloughing and a small abscess in the uretero-colic interval exuded pus into the ureter. It appeared well walled-off.

The final revelation rouses speculation regarding ætiology. Was not infection, possibly tuberculous, of the right kidney responsible for this obscure vesical lesion and the latter curable in its early history by nephrectomy; or, in the later stage, would not defunctionation of the bladder be the only hope?

W. W., aged 63, came with an intolerable cystitis of some five years' duration and I diagnosed a primary refractory ulcerative cystitis. The only way out of his misery appeared to be by the drastic remedy of defunctionating the bladder. I performed left uretero-colic union on 30.5.45, and was delighted with the prompt benefit. But his old symptoms are back again and diarrhœa in addition. I am deterred from completing the diversion of urine from the bladder with right ureteric transplant, which would seem the logical procedure, owing to a startling radiographic discovery—gross calcification in his prostate! This invalidates my original opinion, will probably alter the treatment and teaches the *grave responsibility of infallible diagnosis* before embarking on a profound and irrevocable transgression on the body.

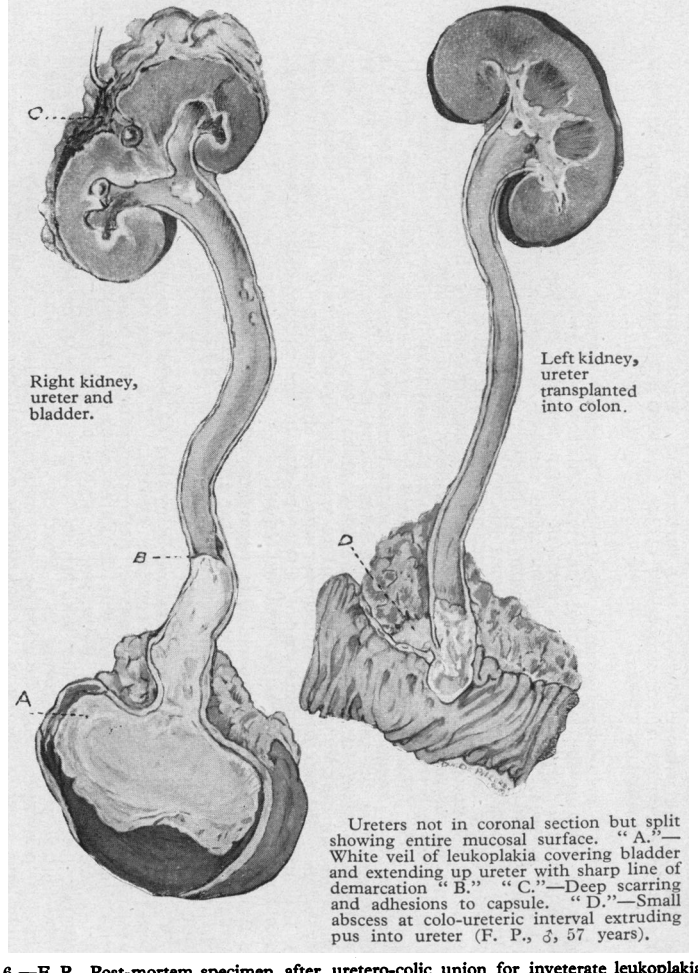

FIG. 6.—F. P. Post-mortem specimen after uretero-colic union for inveterate leukoplakia of bladder and right ureter.

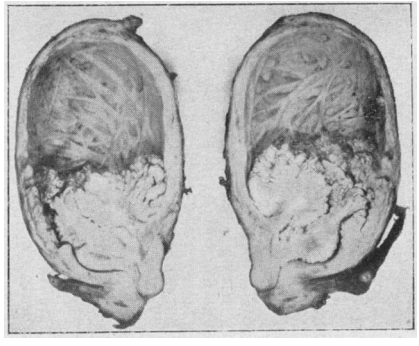

FIG. 7.—F. L. Section of cancerous bladder and internal genitals removed after uretero-colic union.

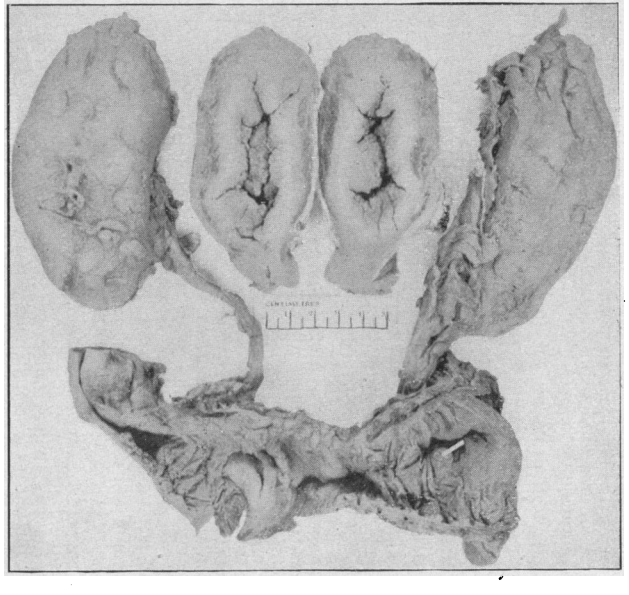

FIG. 8.—Post-mortem specimen four months after creation of new urinary tract—excised bladder in section shown between kidneys.

Tuberculous Cystitis

Specific infection of the bladder may also cause intense incurable suffering and I have been glad to try ureteric transplant to ease the sad lot of two tuberculous cases.

R. W., aged 10 years, is a boy whose painful frequency of many months, with urine repeatedly sterile, I attributed to vesical calculi. His complaint did not abate after litholapaxy and further investigation led me to suspect the right kidney as the "fons et origo" of his trouble. (Pyelography 7.12.43.) Accordingly, on 11.1.44, I explored the loin and removed a tuberculous kidney and ureter. The large kidney was a shell expanded by tuberculous pus and calcareous material, which provided the obvious source of the vesical pathology. Healing was quick and he was discharged to a sanatorium. However, by May 1944, micturition had become so excruciating that his heartrending cries led neighbours to protest. On readmission the house surgeon tried to free debris blocking the urethra, but it was obvious the child was nearing his end so the parents allowed me to turn the flow of urine from the residual left kidney into the colon. Reaction was alarming and, despite intravenous fluids, urine did not appear from the bowel for five days. On 15.6.44, four ounces of pus were drained from the dorsum ilii and formal cystostomy done after finding copious foul discharge expressible *per urethram*. Cystitic pain and discharge compelled me to complete the procession of operations by total cystectomy and vesiculo-prostatectomy on 6.7.44. He soon healed, learnt to use his bowel conveniently and became quite a cheery little fellow. A tendency to flat foot has been cured by cycling, but he puts on little weight and now has a blood urea of 95 mg.%. If we cannot hope to give him length of life, at least he is proceeding happily whilst it endures. How much mutilation, suffering and major surgery might have been saved by timely diagnosis!

In the second case, B. L., aged 27, the primary left renal source of her urinary tuberculosis had been removed two and a half years before she reached me in July 1945. She was still disabled and pale with moderate frequency, pain in the right loin and a blood urea of 100 mg.%. Transplant of the right ureter to bowel seemed the only hope for her future. Cystoscopy confirmed the presence of tuberculous ulceration and this was the cause of a dilated right kidney and ureter. Urine from the latter was guinea-pig positive.

These are early days but they are her first delightful ones for a long time and her weight is obviously increasing. "Is there any preferable alternative?" appears a legitimate question.

Vesical Carcinoma

Just as vesical defunctionation has brightened the dark corners of cystitic pathology, so it is offering great promise in the gloomy sphere of bladder cancer. This disease, while unfavourable for conservative surgery, is relatively slow to spread from the bladder. If, therefore, we can treat it radically and dispense with the bladder, the patient's prospects of effective succour are good.

My experience is but recent and starts with a man, F. L., aged 36, sent to me on 30.3.42 with pain and intermittent hæmaturia. Diathermy was tried tentatively but, six months later, a radical operation became imperative and a hydronephrosis had enlarged the right kidney four times. On 2.10.42 I transplanted a normal left ureter to the colon and performed a right cutaneous ureterostomy with corresponding nephrectomy a month later. On palpation of the bladder the growth was felt the size of an orange but movable. Two months after the transplantation, total cysto-prostatectomy was performed, as usual under spinal anæsthesia (fig. 7). Occasional gas and oxygen is added in a few cases. The peritoneal veil remained inviolate. After an eventful convalescence he resumed light work the following summer and, this October (1945), tells me he has only been off work five days in the past two years. Urination is $\frac{D\ 6 - 8.}{N\ 1}$ he is cheerful, the abdomen feels healthy and he maintains his weight at 11 stone. His blood urea figure is 0·038%, but the pyelogram is of subnormal density and mildly dilated.

G. P., aged 42, came first to me on 29.1.43, having a sixteen months' history of increasing painful frequency and hæmaturia which had already been treated by diathermy and cystostomy. The lesion was obviously advanced carcinoma showing a filling defect with crenated outline in the cystogram and bilateral hydronephrosis. At the transplantation I noted the bladder was the size of a lemon and no extension of the disease beyond it. Swabs of ureteric urines proved to be sterile. The post-operative pyelograms showed full function on the left side and about 50% on the right, which is significant as distension of the right ureter had been noted at the operation. After total cysto-prostatectomy, on 12.5.43, he got on fairly for two or three days but died of obstruction on the fifth day. Post-mortem showed the new urinary drainage system in good working order. There was moderate pelvic peritonitis but the lethal factor was a band acutely obstructing the last two feet of the ileum. A broad adhesion joined the terminal ileum to the pelvic colon. These were due to peritonitis around the previous anastomosis. The newly created effluent' system, right ureter included, looks competent in the photo of the specimen and the cadaver appeared clear of neoplastic remains (fig. 8). How poignant are the surgeon's regrets over the fatal adhesions incidental to uretero-colic union, and how pregnant the precautions advocated by Jewett for minimizing such!

H. M., aged 40, started in April 1944 a dull ache in front and back of sacro-iliac region. Frequent painful micturition was gradually added and, by August, blood in the urine which recurred till he came to me in November. He looked in fair health

but obviously distressed. A malignant papilliferous tumour was found on cystoscopy, encircling the bladder neck. The ureters were joined to the colon on 14.11.44, and hiccoughs were notable in an otherwise smooth healing. Six weeks later he had total vesico-vesiculo-prostatectomy and went home well on the eighteenth day. Reviewed on 8.10.45, he looks and feels well. Urination is $\frac{D\ 6-8,}{N\ 1-2}$ blood urea was 36 mg.% and post-operative pyelograms show healthy structure. His only complaint is weakness in the back with heavy work.

W. H. J., aged 54, is still more recent, coming in January 1945 with malignant tumour choking the outlet of his bladder which was half-way up to the navel. Hæmaturia troubled him for the previous nine months and marked frequency had supervened. For this man of light build and rather waxy hue the sole effective remedy involved ureteric transplantation which was done on 9.3.45, and he went home in the third week. Bladder washes were done and acute epididymitis allowed to settle, prior to the total cystectomy, 4.5.45. Dr. A. D. Fraser reports: "This is a carcinoma . . . composed of rapid and irregularly growing cells of Malpighian cell layer type . . . marked infiltration of the bladder wall." He is (16.10.45) quite cheerful and wants to start work. He still wears a spare aspect and has recently felt pain in the left groin for which no physical signs are forthcoming apart from a few tender shotty glands. His frequency is $\frac{D\ 3-4\ \text{hourly,}}{N\ 3-4\ \text{times}}$ and pyelography shows the left kidney twice its normal size and the right one and a half times.

E. W., aged 69, came in January 1943 the victim of advanced vesical cancer and superadded cystitis. She was the victim, too, of Mars for, having resorted to her doctor two years previously and been labelled cystitis, she was blitzed to a hospital in another town and, when she returned, found her doctor gone to the war! Her incessant vesical spasms were ghastly to behold and I performed ureteric transplantation. She succumbed three days later and autopsy showed a clean peritoneum and clean right ureter but the left was clogged with blood down to a short indwelling tiny rubber tube, the only one used in this series. Kidneys and bladder were grossly septic. Four cancerous foci were seen on base, back and dome of bladder but no extra-vesical deposit.

My last case, Q. P., aged 35—almost equally harrowing a sight and destitute of hope—started her illness in May 1944 with soreness just within the vagina which became severe by September. By January 1945 suprapubic cystostomy was done owing to super-added dysuria and radium used shortly after for urethral cancer. The urogram, when she came to me in August, was informative, revealing good renal excretion. A large hard mass of growth behind the pubes was felt ineradicable, but diversion of urine to the colon offered a faint hope of alleviating her ghastly lot. She died twelve days after the operation and, probably, of terminal collapse of lower lobes of her lungs. The transplants had taken satisfactorily but pyonephrosis and several tiny abscesses had affected the right kidney and in the left was recent mild pyelonephritis. The primary involved the urethra and bladder base and was fused to the symphysis pubis and associated with a few hepatic nodules suggestive of secondary spread. Presumably it started in the urethra.

While the operation earlier might have paved the way to surgical cure of the cancers it was only used as a desperate last resort in these two women. It failed, but nevertheless I believe it worthy of trial as a palliative in some cases of this most distressing form of cancer.

Disease		Total	Op. mort.
Obstetric fistula		1	—
Refract. ulc. cystitis :	M.3*, F.4	7	1
Tuberculous cystitis :	M.1†, F.1	2	—
Carcinoma vesicæ :	M.4, F.2	6	2
		16 (11 bilateral)	3 (2 bilateral)

*Precise pathology uncertain.
†Boy of 10 years—all others adults.

The three fatal cases were so ill prior to operation as to need no further comment. Apart from the obstetric category, the material handled obviously involves a high operative risk so that the results are far from discouraging.

Two cases have died subsequently. One (F. W.), with pyelonephritis, had been a very sickly female for years and the operation played but a small part in her ending. The other (G. P.), with acute obstruction, ranks as a serious surgical disaster pointing to the dangerous complication of adhesive peritonitis.

The Latent Morbidity

What moves me more than the mortality is the *insidious morbidity*, masked clinically by the patients dominating sense of well-being, that often follows this operation. Most cases show dilated urograms and one patient a stone in the kidney. Their weight is apt to be stationary and the blood urea raised. In fact, these features point to early renal impairment; and it is this, rather than infection, that seems to me still to leave the future of these patients somewhat clouded. Is not inflammatory reaction in the colonic bed of the ureter, resulting in fibroses. the pathological crux of the undertaking? To minimize this peri-ureteritis and urinary stasis, the procedure demands most meticulous surgical

performance and, in the seriously-ill types, I hope to try the extra insurance afforded by the two-stage principle introduced by Ferguson and admirably developed by Jewett with his highly specialized technique.

Conclusion

From the foregoing it is clear that the operation has established a permanent and important niche in the surgery of many serious vesical disorders. In a minority, it is well that a few weeks should elapse between the transfer of right and left ureters. In a still smaller group, the diversion of one ureter alone may be curative—the patient may have but one. But, whether in certain cases the retro-peritoneal junction represents a real advance, time must decide.

I herewith acknowledge my great collective debt to authors and publishers for their permission to borrow both text and illustrations, and to workers whose names do not appear in the bibliography.

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True Aneurysm of Left Renal Artery.—A. J. Heriot, F.R.C.S.

Mrs. S., aged 49. First seen on 4.12.44. Her complaints were of a swelling in the left side of the abdomen, first noticed five months previously and which had increased in size and, further, there was now a throbbing sensation. She was known to have suffered from high blood-pressure for the previous three years.

Past history.—Nothing significant. Has two children, aged 21 and 22. No history of injury.

Clinical examination revealed that there were two parts to the swelling in the left abdomen—one in the loin, which was definitely renal, without pulsation or bruit—whilst internal to that there was a pulsating tumour, almost certainly aneurysmal. The appearance of the pyelography and retrograde films suggested that this tumour arose from the renal artery rather than from the aorta or splenic vessel.

The following tests were carried out:

Urea concentration test:	*Time*	*Volume*	*Urea%*
	1st hour	40 c.c.	2·3
	2nd hour	62 c.c.	2·65
	3rd hour	37 c.c..	2·4

Blood urea 37 mg.%

Wassermann reaction negative.

Urine: An occasional red blood corpuscle and granular cast seen—otherwise normal.

The blood pressure on admission was 235/145 but with rest in bed prior to operation, the lowest figure was 175/95.

It was felt justifiable to explore this tumour and this was carried out on 15.12.44 by an anterior approach, employing a T incision. Operation confirmed a large aneurysm of the renal artery which, with some difficulty, was freed from the aorta and a short pedicle ligated. Specimen showed a very large aneurysm of the renal artery compressing and deforming the pelvis and histological examination revealed an extreme degree of renal ischæmia. The report on the specimen was as follows: "Compression of the kidney has led to destruction of the normal histological appearances with extensive tubular atrophy. Marked pathological changes are present in the glomeruli and their afferent arterioles. All degrees of hyaline change can be seen in the former, from peri-glomerular fibrosis and early hyalinization with shrinkage of the tuft to, in the majority of cases, complete obliteration