

## Section of Urology

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### President's Address

#### Hydronephrosis: A Fourteen Years' Survey of Results [*Abridged*]

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Hydronephrosis is quite impartial in its choice of side. Indeed, in more than half the cases, it affects both kidneys. For this to be accepted there must be a gross defect in the excretory urogram, in the excretion of indigo carmine or, most important, a significant retention of opaque medium in both kidneys after retrograde pyelography. I have treated 150 patients since 1947; 45 were right-sided, 43 were left-sided and 62 were bilateral. Although only 14 patients had both sides explored, quite a number are known to have gross defects in the other kidney, which might warrant operative treatment, but I hesitate to advise this when the patient is not in much distress.

At operation each kidney was studied carefully in an attempt to determine the causal factor. It is often difficult to make a choice, but functional conditions were responsible in at least 100, accessory vessels in 57, and 7 had congenital anomalies such as horseshoe kidney (2), reduplication (1), ectopia (1), extreme mobility (1) and retrocaval ureter (2). The bilateral cases support this. In only 4 out of 24 kidneys did the hydronephrosis appear to be due to accessory vessels, and only one of these patients had vessels on both sides. Thirty-one patients had vessels to the lower pole which were not regarded as being causal.

When the kidneys are separated into intrarenal and extrarenal types (Table 1), I am disturbed by the fact that accessory vessels are chosen as the causal factor in an undue number of extrarenal hydronephroses, and that when vessels are present, but not regarded as causal,

most of these cases are intrarenal. This leads me to think that I have attached too much importance to vessels as the immediate causal factor, although I firmly believe that they are a serious aggravating factor in extrarenal cases, where the dilated pelvis herniates between leashes of vessels. The embarrassment caused by such vessels is sufficient to convert a mild case into one that requires surgical intervention if the kidney is to be saved. I maintain that accessory vessels are the primary causal factor in some cases. My reasons for this are: (1) Hydronephrosis occurs in cases of retrocaval ureter, of which there are 2 in this series. (2) At operation, in a case that is obviously functional, when the ureter is freed, the pelvis seldom propels its contents down the ureter with each contraction; in other words, a ureteric contraction does not follow each pelvic contraction, and when the ureter is cut across, pelvic contractions do not expel a spurt of urine from the stump. In such cases there is often a persistent constriction of the ureter, presumably due to spasm, because there is no demonstrable organic stricture. In contrast to this, when vessels appear to be the cause, the segment of ureter above the vessels is dilated, it contracts in sympathy with the renal pelvis and the contraction stops at the vessels. When the ureter is freed from the vessels, the contractions are propagated down the ureter, and when the ureter is cut across a spurt of urine accompanies each pelvic contraction. (3) The undoubted success of Hamilton Stewart's operation (Stewart 1947) must to some extent depend on vessels being the cause.

Twenty-seven kidneys were exposed and no plastic operation was done. Of these 19 had a primary nephrectomy. No kidney has been removed since 1958 and only 4 since 1951. From these figures it would appear that kidneys that were formerly removed are now conserved. Perhaps patients come earlier and diagnostic methods are better.

The Anderson-Hynes plastic operation has been performed on 122 patients since February 1947 (Anderson & Hynes 1949). Ten of these patients have had operations on both kidneys.

**Table 1**  
Cause related to type of hydronephrosis

|                              | Intrarenal    | Extrarenal           |
|------------------------------|---------------|----------------------|
| Functional Vessels           | 52<br>12 } 64 | 53<br>47 } 100 = 164 |
| Vessels present - not causal | 18            | 13                   |

That infection plays a vital part is well appreciated. In 81 patients the urine remained sterile throughout and fortunately this applied to all bilateral cases. In 7 patients the urine was sterile at first, but when aspirated from the renal pelvis at operation it was found to be infected. This was presumably due to the retrograde pyelography. In 1948 and 1949 3 lost their kidneys and are included among the 19 primary nephrectomies. At that time cystoscopes and ureteric catheters were sterilized by accepted chemical agents. From 1950 till 1955 cystoscopes were boiled but chemical sterilization was relied upon for the ureteric catheters. During this period 4 patients were infected, but all retained their kidneys. Since 1955 everything used at cystoscopy, including the ureteric catheters, has been autoclaved, and not a single patient has been infected. All investigations are done on outpatients who go home immediately afterwards. They are given a sulphonamide cover for twenty-four hours and 1,000,000 units of penicillin after the pyelogram – this custom was instituted in 1949 and may be unnecessary now. It does little harm, but there are occasional allergic responses both to sulphonamides and penicillin.

In 31 patients the urine was sterile at operation but became infected afterwards. Two of this group lost their kidneys. In 16 patients it is known that the urine has become sterile. Others have no trouble and are presumably free of infection. Two were infected for a long time, but have no present symptoms, though they have not had recent tests. Two others are known to have persisting infection.

When first seen 28 patients were infected, 7 had primary nephrectomy. Two had nephrectomy after unsuccessful plastic operations. Seventeen are known to have become sterile after plastic operations, but 2 have persistently recurring infections.

After the operation 3 patients developed stones, but 2 were sterile throughout and 1 was infected when first seen.

In only 29 out of 132 kidneys was a nephrostomy established at the operation. There has been no nephrostomy since August 1951. A few of the earlier patients had no nephrostomy, but after August 1948, when the first patient to have an Anderson-Hynes plastic operation (Case 10) had extravasation following operation on her second kidney, nephrostomy became a routine for the subsequent three years. In April 1951 Sir Eric Riches criticized this procedure and I abandoned the evil practice. Of these 29 patients 3 lost their kidneys, whereas only 3 of the remaining 103 had nephrectomy afterwards. One significant feature is that most of these patients had a raised temperature whilst the tube was *in situ*. The temperature subsided as soon as the tube was removed.

## Results (Table 2)

It is not easy for me to produce unbiased figures. The patients with 'very good' results maintain that they have no pain, and to a great extent the clinical assessment is supported by the radiological appearances. A large proportion of these are earlier patients operated on when I was learning what happened afterwards. Those with 'good' results have some complaints, usually of pain which in many instances may be unrelated to the kidney.

Table 2  
Results

|                    | Clinical | Radio'logical |      |             |
|--------------------|----------|---------------|------|-------------|
|                    |          | Very good     | Good | Indifferent |
| Very good          | 88       | 21            | 27   | 2           |
| Good               | 18       | 2             | 11   | –           |
| Indifferent or bad | 8        | 1             | 2    | 4           |
| Died               | 2        |               |      |             |
| Too early to value | 6        |               |      |             |
|                    | 122      |               |      |             |

Two patients died. One, a man aged 51, died of uræmia on the tenth post-operative day. He was deeply uræmic when first seen and had a grossly hydronephrotic polycystic right kidney; the left kidney was a tiny atrophic remnant. He had a plastic operation on the polycystic kidney. The other patient was a hypertensive middle-aged woman with advanced osteitis deformans. She died of a cardiac accident on the thirteenth post-operative day when ready for home. A lesson was learned from the post-mortem: both sides of the ureter had been picked up by the catgut stitch. To avoid this occurrence a ureteric catheter is inserted whilst the angle at the apex of the lower pelvic gutter is being negotiated.

Six operations have been done within the past nine months and may be too recent to evaluate, but all 6 patients appear to be well and symptom free.

The eight 'bad' results are now discussed in greater detail.

**Case 1** A woman, aged 47, was seen as an emergency in December 1947. She had a tender mass in the right loin, due to a staphylococcal infection of the right kidney. On January 20, 1948, she had a plastic operation with a nephrostomy. It was a unilateral functional intrarenal type of hydronephrosis. There were no immediate post-operative complications and the function of the kidney improved, but later there were recurrent inflammatory episodes. The kidney was reluctantly removed four years after the operation. Photographs taken after removal show a good pelvi-ureteric funnel.

**Case 2** A man, aged 37, with calcifications in both kidneys was discharged from the Army as a case of renal tuberculosis, after spending nine months in a military

hospital. His urine was infected when first seen in July 1947. The excretory urogram showed a bilateral functional intrarenal type of hydronephrosis. On October 27, 1948, a plastic operation on the left kidney was performed and a mistake was made: a substantial portion of a small renal pelvis was removed, whereas none should have been resected. He had a nephrostomy. The wound healed and his urine became sterile and remained so, but his pain was worse, probably because the renal pelvis was too small. After eighteen months, on March 9, 1950, the kidney was removed.

**Case 3** A man, aged 49, was seen towards the end of 1948 with a right renal tumour. His urine was sterile. The opaque medium injected from below did not pass beyond the pelvi-ureteric junction. He obviously had a large right hydronephrosis. An excretory urogram taken within fourteen days showed moderately dilated upper urinary tracts, but the gross hydronephrosis recurred. This is one of 3 cases in which I have X-ray evidence of the intermittent character of the condition in some instances. On October 9, 1948, a plastic operation was performed with a nephrostomy. The conduct of the operation was unsatisfactory. The patient's temperature was raised and the nephrostomy tube was retained for twelve days because of this. This was much too long and it was probably the cause of the persistent pyrexia. He developed a urinary fistula. The kidney was removed three months later. The condition appeared to be bilateral and was functional. The hydronephrosis was extrarenal. This is the only instance of a persistent urinary fistula following this operation.

**Case 4** In 1949 a boy, aged 12, presented with incontinence of urine by day and by night. He was found to have two stones in the left kidney and there was evidence of hydronephrosis of an intrarenal type affecting both kidneys. The left kidney was explored on January 31, 1950. The kidney was rotated backwards. A renal plastic operation was performed and the stones were removed. A nephrostomy tube was retained for four days. He was an unfortunate child and when seen for the last time a year after the operation he was wet and unhappy. His urine was sterile and he had no symptoms referable to the kidneys.

**Case 5** In 1950 a woman, aged 56, was investigated by a physician. She was diabetic and hypertensive and a diagnosis of pyelonephritis was made. The urine was infected. When seen ten years later in May 1960, aged 66, she had a heavily infected urine and had gross hydronephrosis affecting the right kidney. At first she refused operation, but later, at her own request, she was operated upon on October 11, 1960. She had unilateral intrarenal hydronephrosis and the kidney was flabby. The condition may have been due to vessels. Immediately after the operation the blood urea rose from 40 to 225 mg/100 ml and she had alkalosis. The condition settled and within a month the blood urea was 35 mg/100 ml. A month later, after discharge from hospital, the wound became infected and had to be incised. At the end of 1960 her urine was infected. She still complained of pain. The kidney was palpable and a recent excretory urogram showed no apparent function. A retrograde pyelogram was carried out on

October 20, 1961. The opaque medium did not pass beyond the pelvi-ureteric junction. In a more co-operative patient I might attempt another plastic operation, but in this instance nephrectomy would appear to be the better choice.

**Case 6** A woman, aged 43, was seen by me in 1953. She complained of pain in the left flank. In 1946 she had been investigated by another surgeon and there appeared to be no function in the left kidney. Investigation in 1953 showed that she had a gross left hydronephrosis with no apparent function. The condition appeared to be bilateral. On December 8, 1953, a plastic operation was performed on the left kidney. The kidney was baggy and adherent. The hydronephrosis appeared to be due to vessels. She was well for three years, when she developed intestinal symptoms. A barium meal showed indentation of the stomach and narrowing of the descending colon. Later a left upper abdominal tumour appeared. Laparotomy was suggested, but it was two years before she agreed. An excretory urogram, like those of 1946 and 1953, showed no function. On October 18, 1958, she was explored and a hydronephrotic adherent kidney (13 cm in diameter) with the colon stretched on its surface was removed. There appeared to be no communication between the renal pelvis and the ureter. On section there were no recognizable glomeruli but tubules were still to be detected. She is not hypertensive. Her urine was sterile throughout.

**Case 7** A man of 27 was seen at the end of 1954 with left renal colic. He had a left intrarenal hydronephrosis, unilateral and functional. His urine was sterile. The operation was difficult because he could not be intubated and was muscular; to make things worse the anastomotic suture was accidentally cut and it tended to become undone. After the operation his urine was infected. On August 25, 1955, six months later, the kidney was removed. There was only  $\frac{1}{4}$  in. of renal cortex and numerous cortical abscesses. His father had a kidney removed for hydronephrosis.

**Case 8** A woman, aged 50, was seen in 1956 with hæmaturia and right loin pain. She had three previous laparotomies for uterine and tubal trouble and had a thrombosis of the right leg in 1945. She proved to have a hydronephrotic ectopic right kidney of an extrarenal type. The fallopian tubes were calcified. Her urine was sterile. She had a renal plastic operation on May 31, 1956. Afterwards her urine was sterile but she had occasional bouts of cystitis later. A year later the excretory urogram showed excellent renal function but she complained bitterly of pain and insisted upon having the kidney removed. This was done reluctantly. A photograph showed a kidney of good texture with a wide pelvi-ureteric funnel. I get some morbid pleasure from the fact that her symptoms are no better since the kidney was removed. The condition was unilateral and due to a congenital anomaly.

### Diagnosis

The most important step in diagnostic procedure is the retrograde pyelogram. It is safe with adequate precaution. Everything used should be

autoclaved, adopting as far as possible a non-touch technique. [Mr Anderson demonstrated his method of sterilizing ureteric catheters (Scaife 1958).] I insist on the tip of the catheter being below the pelviureteric junction. The opaque medium may not negotiate the obstruction, but none the less the site of the obstruction is adequately determined (Fig 1A). Pyelograms are obtained on both sides to demonstrate bilateral defects (Fig 3). I inject the opaque medium in small amounts (smaller in children) to avoid over-distension of the pelvis which is painful and may inhibit contraction of the pelvic muscle and so delay emptying. The injections are repeated until a good pyelogram is obtained. It may be necessary to move the patient, possibly into the prone position, so that the opaque medium mixes with the contents of the dilated renal pelvis. After a good pyelogram is obtained, an additional injection is made and the ureteric catheters are withdrawn. The patient walks about for 10 minutes when another picture is taken. The pelvis should be empty. If there is substantial retention and if the ureter is not seen, there is mechanical or functional obstruction at the lower limit of the retained medium. This should be at the pelvi-ureteric junction to justify an operation at this site (Fig 3).

#### *Operative Procedure*

With the patient supine the kidney is approached through an anterior oblique incision running from the eleventh or twelfth rib towards the umbilicus. This gives excellent access to the pelvi-ureteric junction which is usually rotated forwards by the impact of the dilated pelvis on the psoas muscle, but in this series there were 8 patients in whom the rotation was backwards. This causes some slight embarrassment. There is no necessity to mobilize more than the lower half of the kidney. Three stay sutures are inserted for guidance (Fig 2). One immediately below the pelvi-ureteric junction, the second in the upper ureter distal to the proposed level of section, and the third at the upper limit of the pelvic resection. The ureter is divided distal to the obstruction; from a point on the pelvis immediately below the pelvi-ureteric junction and above the stay suture at this site an incision is carried directly backwards towards the hilum and a gutter or flap is fashioned from the lower part of the pelvis. Then the incision is carried upwards parallel to the hilum towards the uppermost stay suture until sufficient of the pelvis has been resected. It is tempting to remove too much. I have done this on 8 occasions but only once with unfortunate results. The patient with a bifid pelvis is in most danger (Fig 1A, C). If too much pelvis is removed

drainage from the upper major calyx may be embarrassed (Fig 1C). If the pelvis is small none should be resected (Fig 3). The object of this operation is to remove the obstructing agent and establish an oblique anastomosis of sufficient length to cicatrize yet not stenose. Using a continuous 4/0 plain catgut suture, taking close bites with the needle, the upper portion of the opening into the pelvis is closed until an aperture 2.5 to 3 cm in length is left at the lower end. The upper ureter is slit for 2.5 to 3 cm on its posterior aspect, and the ureter is anastomosed to the aperture in the renal pelvis using the same continuous suture. While stitching the apex of the pelvic gutter to the distal end of the slit in the ureter it is advisable to insert a ureteric catheter or probe to prevent both walls of the ureter being transfixed by the needle. This operation provides good dependent drainage, and it affords some compensation for shortening of the ureter. The lengthy anastomosis does not stenose if it undergoes cicatricial contraction. Accessory vessels are conserved and the pelvi-ureteric junction is transposed to the anterior aspect of such vessels. In functional cases success is achieved by resecting the pathological portion of the ureter and by providing a wide pelvi-ureteric outlet, so that the ineffective muscle can work to better advantage. The anastomosis is not splinted and the kidney is not drained. An additional advantage from the anterior approach is the excellent view of the interior of the kidney. On 6 occasions stones have been removed during the operation (Fig 3). This approach has made this easier. On 2 other occasions small stones could not be found, but fortunately the patients passed these spontaneously after the operation.

**Case 9** The patient, a boy aged 9, was seen at the Children's Hospital, Sheffield, early in 1952. He was suffering from a constitutional disturbance with vomiting and listlessness and had an enlarged abdomen. This proved to be due to huge bilateral hydronephroses. Pre-operatively the blood urea was 53 mg/100 ml. On April 22, 1952, a plastic operation was performed on the grossly hydronephrotic right kidney. The blood urea rose to 115 mg/100 ml and an electrolyte upset was corrected. On July 29, 1952, the left kidney was exposed. [Mr Anderson showed 5 photographs taken during the operation to demonstrate his technique. They showed the excellent access provided by the anterior approach.] He had very little upset from the second operation, although his blood urea rose from 48 to 88, but quickly fell to 48 mg/100 ml. No nephrostomy was established at either operation. He is now a healthy, athletic young man. His blood pressure and blood urea remain slightly raised.

I have not found hypertension to be associated with hydronephrosis.

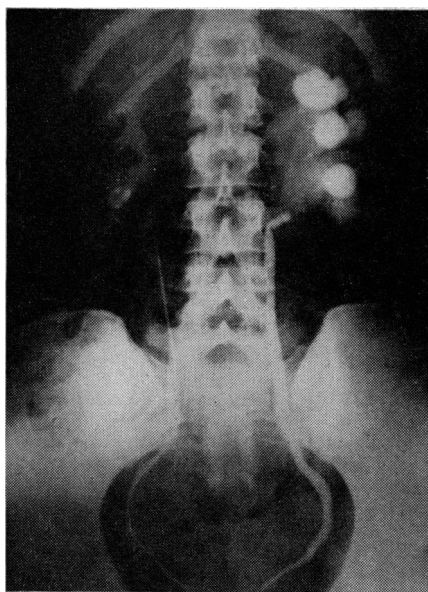


Fig 1A



Fig 1B

**Fig 1 Case 10** The first Anderson-Hynes renal plastic operation. A, pre-operative retrograde pyelogram. B, pregnant following a plastic operation on left kidney: the left kidney is normal, the right is grossly hydronephrotic. C, both sides have had a plastic operation; too much of the right renal pelvis was removed. The right upper major calyx is dilated. D, subsequently the right kidney recovered.

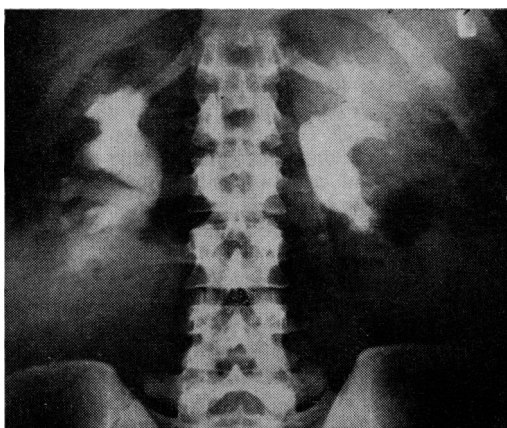


Fig 1C

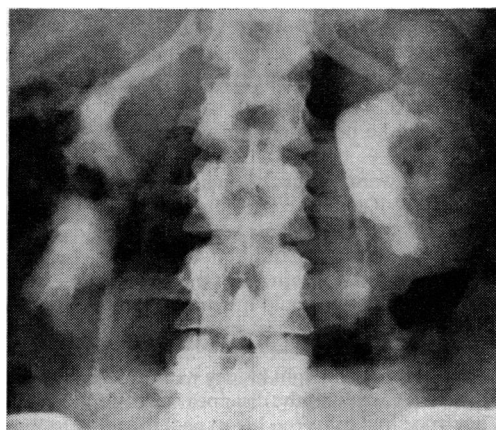


Fig 1D

### Interesting Cases

**Case 10** (Fig 1) This patient, a woman aged 24, was the first to have an Anderson-Hynes renal plastic operation. The left side was operated upon on February 26, 1947, with a nephrostomy, the only kidney in the series approached posteriorly. The right side was operated upon on July 6, 1948, without nephrostomy, but she had extravasation. It was this incident that led to the routine establishment of nephrostomy for three years. At the second operation it was noted that too much renal pelvis had been removed, but the final result is good. On July 28, 1948, her father had a renal plastic operation for a left-sided hydronephrosis. Since then two of her children have been investigated for renal colic, but no lesion was found.

**Case 11** A woman, aged 47, was seen in April 1957 with pain in both flanks. She had stones in the lower pole of both kidneys with dilatation of the right renal pelvis and gross ten and thirty minutes' retention in the right kidney after retrograde pyelography. There was no significant retention in the left kidney. On February 17, 1959, she had a left lower polar nephrectomy. On March 4, 1959, her right kidney was explored. The stones were removed and a plastic operation was performed. The condition was functional. The renal pelvis was of the typically dangerous bifid type, and I was guilty of removing too much, but succeeded in refashioning it by stitching the upper and lower edges of the gaping pelvis to each other. I then carried out a renal plastic operation. Urine leaked from the wound for about twelve days,

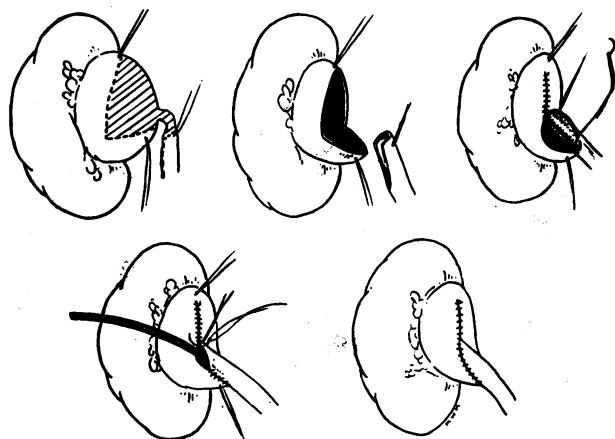


Fig 2 Diagram illustrating the Anderson-Hynes operation. The ureteric catheter is removed at the end of the operation. (Reproduced from Anderson, 1953, by kind permission)

but after I passed a ureteric catheter this ceased and the result is good.

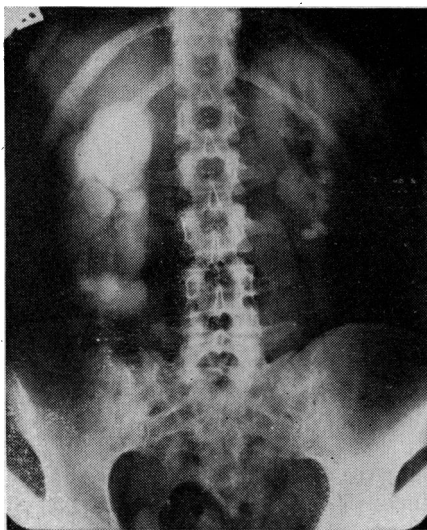
If urine leaks from the wound for longer than seven to ten days I pass a ureteric catheter which is not retained. The leakage stops immediately afterwards. One patient, the third of the 'bad' results, had a persistent leak.

**Case 12** A woman, aged 52, who was referred by Professor A W Kay. She complained of nausea and heaviness for two years. Twenty years ago she had one incident of hæmaturia lasting for several days. Investigation showed ten stones in a grossly hydronephrotic right kidney. At no time could the presence of a left kidney be demonstrated by excretory urograms or retrograde pyelograms. Subsequent X-ray showed that the number of stones in the right kidney was reduced to four. It is difficult to explain the disappearance of these stones. They appeared to be too big to pass through the pelvi-ureteric junction. She had no history of renal colic and was not aware of having passed any stones. She had a renal plastic operation on February 12, 1959. A photograph taken at the operation showed that I had gone dangerously close to the bifurcation of the major calyces. The pelvi-ureteric junction was quite narrow and only a thin stream of urine could be expelled. An excellent anastomosis was achieved and a photograph showed that it was fully 4 cm in length. She was discharged on the eighth post-operative day. This is one of four instances of the operation being done on a solitary kidney.

**Case 13** This man, aged 31, was referred by a surgical colleague from a neighbouring town. He had had pain in the right loin for six years and had excretory urograms carried out in 1956, 1958, 1960 and 1961. He had bilateral hydronephrosis, the left being worse than the right in the earlier stages. By 1961 the right side

had become much worse than the left. The retrograde pyelogram showed the typical appearance of a hydronephrosis with a leash of vessels compressing the upper ureter; about 2 cm of a dilated right ureter was seen proximal to the obstruction. On May 11, 1961, a plastic procedure was carried out on the right kidney. The condition appeared to be due to vessels. The hydronephrosis was gross. He made an uncomplicated recovery. On June 22, 1961, the left side was dealt with. Again, the condition appeared to be due to vessels. After the second operation he had an extremely stormy course. He developed a sterile left-sided pleural effusion. Then he went into an electrolyte crisis during which his blood urea rose from 38 to 120 mg/100 ml. He had extravasation and developed a leak which persisted for close on a fortnight. It ceased shortly after a ureteric catheter was passed. Despite the considerable leak from his left flank he passed a substantial amount of urine from the bladder indicating that the right kidney was functioning effectively. When seen in August he was in good health. His blood pressure was normal and his blood urea was 29 mg/100 ml.

**Case 14** (Fig 3) A woman aged 35, was referred in March 1961 by Professor Kay. She had had pain in the left loin for two years. She had 2 stones in the lowest calyx of the left kidney and proved to have a gross unsuspected right-sided hydronephrosis. There was bilateral ten minutes' retention. Because the stones would have to be removed from the left kidney it was decided to carry out a plastic procedure on the right side first; this was done on March 7, 1961. It was an intrarenal hydronephrosis of a functional type. The kidney had rotated forward. She made an uncomplicated recovery. On September 9, 1961, the left kidney was exposed. Again it was an intrarenal type of hydronephrosis and this kidney had rotated backwards. The stones were now in different calyces and the second was rather difficult to find, but both were removed through small cortical incisions, followed by a renal



**Fig 3 Case 14** Retrograde pyelogram – ten minutes' emptying film, showing bilateral retention. There are stones in the lowest calyx of the left kidney and a huge unsuspected right-sided hydronephrosis. After the plastic procedure the right kidney excreted 1,500 ml of urine

plastic operation, but no pelvis was removed. Urine leaked through the cortical incisions and she excreted up to 1,800 ml into a bag attached to her left flank, but at the same time she was passing about 1,200 to 1,500 ml of urine from the bladder. This presumably came from the right kidney and showed that it was right to conserve this grossly hydronephrotic organ. In October her blood urea was 36 mg/100 ml.

**Case 15** Whilst he was in the Army a man, aged 23, was investigated in 1950 for hæmaturia. Investigation showed a right hydronephrosis and a left non-functioning kidney. A pyonephrotic left kidney was removed. On April 9, 1951, the right kidney was explored in a military hospital, but no obstruction of the right ureter was found, so nothing further was done. In civil life, on July 31, 1956, he developed anuria. The right renal pelvis was exposed and a nephrostomy established, and on October 8, 1956, another bout of anuria was treated conservatively. On December 11, 1956, he was readmitted with anuria. The right renal pelvis was again exposed and drained. On February 11, 1957, he again had anuria. The renal incision was reopened and a Malecot catheter inserted. On February 22, 1957, an attempt was made to carry out a plastic operation but the attempt was abandoned as the kidney was completely obscured by adhesions. The nephrostomy was maintained but on March 25, 1957, attempts to replace the nephrostomy tube failed. At this stage, on March 29, 1957, he was referred to Sheffield. The nephrostomy was dry but he appeared to be in reasonably good condition. His blood urea was 30 mg/100 ml. After being investigated by cystoscopy and retrograde pyelography he was allowed to

go home for Easter, but was readmitted on April 24 in an acute electrolyte crisis. He developed a uræmic pericarditis. The pericardium had to be aspirated and his blood urea rose to 180 mg/100 ml. The electrolyte imbalance was corrected but on May 12 he had hæmaturia and became anuric. In the middle of the night his right kidney was explored but on this occasion the approach was from the front; on previous occasions it had been from the back. I performed a renal plastic operation fairly easily and did not re-establish the nephrostomy. He went home within fourteen days. The blood urea dropped to 36 mg/100 ml and remained at a low level. He appeared to be in perfect health and carried out his occupation as a lorry-driver. On December 12, 1959, whilst riding a motor-cycle, he was killed in a traffic accident, two years and eight months after the renal plastic operation.

Two patients have had the plastic operation repeated on the same kidney. Both have been successful.

**Case 16** A man, aged 26, had a right-sided extrarenal type of hydronephrosis operated upon on November 20, 1951. It appeared to be due to vessels. Following the operation he had pain and an excretory urogram in February 1952 showed no function. At retrograde pyelography the opaque medium failed to enter the right renal pelvis. On April 8, 1952, the kidney was reopened. There was gross cicatricial reaction at the site of the anastomosis, the pelvi-ureteric junction being close upon  $\frac{1}{4}$  in. thick. It was resected and a fresh anastomosis was established. A retrograde pyelogram shortly afterwards showed that the opaque medium did not enter the renal pelvis. Although the patient had no symptoms, the operation was believed to be a failure. In August 1961 he complained of pain on the other side. An excretory urogram showed no defect of the left upper urinary tract and quite reasonable right renal function. A retrograde pyelogram showed that the right renal pelvis could now be filled effectively and it emptied fairly well. He has had no right-sided symptoms since 1952.

**Case 17** A woman, aged 41, presented at the end of 1957 with recurrent right renal colic. On February 11, 1958, the right kidney was explored. It was an extremely movable flabby kidney with a segmental distribution of vessels which ran anterior to the renal pelvis. Afterwards she had trouble and subsequent investigation showed a persistent pelvi-ureteric obstruction. On January 27, 1959, a year after the first operation, the kidney was re-explored; the ureter was embedded in dense fibrous tissue. A plastic procedure was repeated. She had an uncomplicated post-operative course and is now reasonably well with much improved renal function. Her urine, which was infected after the first operation is now sterile.

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