Staff Meeting Bulletin
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Non-Calculous Uretero Obstruction

Volume XIX | Friday, March 5, 1948 | Number 10

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INDEX

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UNIVERSITY OF MINNESOTA MEDICAL SCHOOL
CALENDAR OF EVENTS

Visitors Welcome

March 8 - March 13, 1948

No. 193

Monday, March 8

9:00 - 9:50 Roentgenology-Medicine Conference; L. G. Rigler, C. J. Watson and Staff; Todd Amphitheater, U. H.

9:00 - 10:50 Obstetrics and Gynecology Conference; J. L. McKelvey and Staff; Interns' Quarters, U. H.

9:15 - Fracture Rounds; A. A. Zierold and Staff; Ward A, Minneapolis General Hospital.

10:00 - 12:00 Neurology Ward Rounds; A. B. Baker and Staff; Station 50, U. H.

11:00 - 11:50 Physical Medicine Conference; Role of Proprioceptors in Movement; Ernst Gellhorn; E-101, U. H.

11:00 - 11:50 Roentgenology-Medicine Conference; Staff; Veterans' Hospital.

11:00 - 12:00 Cancer Clinic; K. Stenstrom and D. State; Eustis Amphitheater, U. H.

12:15 - 1:20 Obstetrics and Gynecology Journal Club; M-435, U. H.

12:30 - 1:20 Pathology Seminar; Bronchial Arteries; Robert Blomberg; 104 I.A.

12:30 - 1:30 Physiology Seminar; Studies on Arterial Venous Sugars in the Eviscerated Dog; Roger M. Rienecke; 214 M. H.

12:30 - 1:50 Surgery Grand Rounds; A. A. Zierold, Clarence Dennis and Staff; Minneapolis General Hospital.

1:30 - 2:30 Pediatric-Neurological Rounds; R. Jensen, A. B. Baker and Staff; U.H.

4:00 - 5:00 School of Public Health Seminar; Report of the President's Scientific Research Board; Mary E. Switzer, Assistant to the Administrator, Federal Security Agency, Washington, D.C.; 113 MeS.

4:00 - 5:00 Pediatric Seminar; Physiological Aspects of Poliomyelitis; Dr. Frank Gollan; 6th Floor Seminar Room, U. H.

5:00 - 6:00 Urology-Roentgenology Conference; D. Creevy and H. M. Stauffer and Staffs; M-515, U. H.

8:00 - P.M. Clinical Research Club. Photoelectricplethysmography as Applied to Peripheral Vascular Disease, Sheldon Koff; Clinical Application of Bronchospirometry, Lowell Peterson; Eustis Amphitheater, U. H.

Tuesday, March 9

8:30 - 10:20 Surgery Reading Conference; Lyle Hay; Small Conference Room, Bldg. I, Veterans' Hospital.

9:00 - 9:50 Roentgenology Pediatrics Conference; L. G. Rigler, I. McQuarrie and Staff; Eustis Amphitheater, U. H.

10:30 - 11:50 Surgical Pathological Conference; Lyle Hay and Robert Hebbel; Veterans' Hospital.

12:30 - 1:20 Pathology Conference; Autopsies; Pathology Staff; 102 I. A.

2:00 - 2:50 Dermatology and Syphilology Conference; H. E. Michelson and Staff; Bldg. III, Veterans' Hospital.

3:15 - 4:20 Gynecology Chart Conference; J. L. McKelvey and Staff; Station 54, U. H.

3:30 - 4:20 Clinical Pathological Conference; Staff; Veterans' Hospital.

4:00 - 5:30 Surgery-Physiology Conference; O. H. Wangensteen and M. L. Visscher; Eustis Amphitheater, U. H.

4:00 - 5:00 Pediatric Rounds on Wards; I. McQuarrie and Staff; U. H.

5:00 - 5:50 Roentgenology Diagnosis Conference; D. L. Fink and Staff of Veterans' Hospital; M-515, U. H.

Wednesday, March 10

8:00 - 8:50 Surgery Journal Club; O. H. Wangensteen and Staff; M-515, U. H.

8:30 - 12:00 Neurology Rehabilitation and Case Conference; A. B. Baker and Joe R. Brown; Veterans' Hospital.

11:00 - 11:50 Pathology-Medicine-Surgery Conference; Pulmonary Emboli; Carcinoma Sigmoid Colon with Perforation; E. T. Bell, O. H. Wangensteen, C. J. Watson and Staff; Todd Amphitheater, U. H.

4:00 - 5:00 Infectious Disease Rounds; Todd Amphitheater, General Hospital, Veterans' Hospital.

Thursday, March 11

8:15 - 9:00 Roentgenology-Surgical-Pathology Conference; Walter Walker and H. M. Stauffer; M-515, U. H.

8:30 - 10:20 Surgery Grand Rounds; Lyle Hay and Staff; Veterans' Hospital.

9:00 - 9:50 Medicine Case Presentation; C. J. Watson and Staff; Todd Amphitheater, U. H.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

10:30 - 11:50 Surgery-Radiology Conference; Daniel Fink and Lyle Hay; Veterans' Hospital.

11:00 - 12:00 Cancer Clinic; K. Stenstrom and D. State; Eustis Amphitheater, U. H.

12:00 - 12:50 Physiological Chemistry Seminar; Comparison of Excretion of 17-Ketosteroids and 11-Oxycorticoid-like Substances; Joel Bitman; 214 M H.

1:00 - 1:50 Fracture Conference; A. A. Zierold and Staff; Minneapolis General Hospital.

4:30 - 5:20 Ophthalmology Ward Rounds; Erling W. Hansen and Staff; E-534, U. H.

5:00 - 5:50 Roentgenology Seminar; Clinical Signs and Myelograms with Herniated Intervertebral Discs; Bernard J. O'Loughlin; M-515, U. H.

Friday, March 12

8:30 - 10:00 Neurology Grand Rounds; A. B. Baker and Staff; Station 50, U. H.

9:00 - 9:50 Medicine Grand Rounds; C. J. Watson and Staff; Todd Amphitheater, U.H.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

10:30 - 11:20 Medicine Grand Rounds; Staff; Veterans' Hospital.

10:30 - 11:50 Otolaryngology Case Studies; L. R. Boies and Staff; Out-Patient Department, U. H.

11:00 - 12:00 Surgery-Pediatric Conference; C. Dennis, A. V. Stoesser and Staffs; Minneapolis General Hospital.

11:30 - 12:50 University of Minnesota Hospitals General Staff Meeting; Disinfection of Air; Harold Whittaker; New Powell Hall Amphitheater.

12:00 - 1:00 Surgery Literature Conference; Clarence Dennis and Staff; Minneapolis General Hospital, Small Class Room.

1:00 - 1:50 Dermatology and Syphilology; Presentation of Selected Cases of the Week; H. E. Michelson and Staff; W-312, U. H.

1:00 - 2:50 Neurosurgery-Roentgenology Conference; W. T. Peyton, Harold O. Peterson and Staff; Todd Amphitheater, U. H.

Saturday, March 13

7:45 - 8:50 Orthopedics Conference; Wallace H. Cole and Staff; Station 21, U. H.

8:00 - 9:00 Pediatric Psychiatric Rounds; Reynold Jensen; 6th Floor West Wing, U. H.

8:00 - 9:30 Psychiatry and Neurology Grand Rounds; Staff; Veterans' Hospital.

9:00 - 10:30 Pediatric Grand Rounds; I. McQuarrie and Staff; Eustis Amphitheater, U. H.

9:00 - 9:50 Surgery-Roentgenology Conference; O. H. Wangensteen, L. G. Rigler, and Staff; Todd Amphitheater, U. H.

9:00 - 9:50 Medicine Case Presentation; C. J. Watson and Staff; M-515, U. H.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; M-515, U. H.

10:00 - 12:50 Obstetrics and Gynecology Grand Rounds; J. L. McKelvey and Staff; Station 44, U. H.

II. THE SURGICAL MANAGEMENT OF NON-CALCULOUS OBSTRUCTION AT THE URETEROPELVIC JUNCTION

C. D. Creevy
Brian J. McGroarty

Hydronephrosis due to non-calculous obstruction at the ureteropelvic junction occurs rather frequently. This frequency probably results from the variety of causative lesions. (Table 1)

Fibrosis of the ureteropelvic junction, whether congenital or post inflammatory, may cause a true stricture (figure 1) or make the junction so rigid as to impair peristalsis. Ponfick, Aragona and Ostling have described congenital mucosal valves at the junction. In our series of 54 cases there have been one granuloma (figure two) and two instances of polyps (figure three) which appeared to be post inflammatory. There are cases in which the renal pelvis is dilated and the ureter normal without demonstrable mechanical obstruction. Here one must assume atony of the pelvic musculature or spasm at the ureteropelvic junction, although Jewett doubts the occurrence of such factors.

Table I

Non-Calculous Obstruction at the Ureteropelvic Junction

I. Intrinsic
   - A. Stricture
   - B. Mucosal lesions (granulomata, polyps, valves)
   - C. Disturbances of neuromuscular mechanism (spasm, atony)
   - D. Neoplasms (ureter, adjoining structures)

II. Extrinsic
   - A. Distortion (fascial sheets and bands)
   - B. Compression (accessory blood vessels, fascial bands)
   - C. Angulation (nephroptosis?)

Ureteral neoplasms, either primary or secondary, are outside the scope of this paper.

Distortion by a sheet of non-adherent peripelvic fascia, evidently congenital, is common (figure four) but is usually associated with other causative lesions, such as accessory vessels (figure five).

Occasionally a definite fibrous band, adherent to the junction and probably post inflammatory, compresses the junction against the posterior abdominal wall or against aberrant renal vessels. Accessory vessels, like peripelvic fascia, probably cannot produce obstruction except in association with other lesions, although Quinby does not share this view. When accompanied by peripelvic fascia, however, they constitute a frequent cause of hydronephrosis (figure six). In two cases in this series, the upper ureter appeared to be squeezed between the lower pole of the enlarged kidney and the lumbar muscles (figure seven). Nephroptosis also is probably incapable of causing hydronephrosis except in the presence of some other abnormality, such as lower polar vessels or fibrous bands, over which the ureteropelvic junction may be stretched when the kidney drops (figure eight). Van Duzen has reported three cases in which a band extending between the duodenum and renal sinus produced symptoms simulating ulcer, apparently by distorting the duodenum.

Trendelenburg and others have attributed hydronephrosis to a "valve" formed by the apposed ureteral and pelvic walls when the ureter originated high on the medial wall of the renal pelvis, but it seems more likely that this results from the hydronephroses (figure nine). Once this relationship has developed, however, pressure within the distended pelvis tends to close the "valve" and so to aggravate the hydronephrosis.

The Clinical Picture

Symptoms may be absent in non-cal-

culous obstruction, or may include: Occasional vague pains or a constant ache in the flank, intermittent renal colic, recurrent acute pyelonephritis, chronic pyuria or, perhaps, reflex gastrointestinal disturbances. The urine is often normal.

Physical findings are inconstant. The affected kidney may be palpable or tender. Fever usually means infection, and recurrent acute pyelonephritis in children or young adults is seen most often.

The diagnosis depends upon pyelography. The excretory urogram may suffice, but a retrograde ureterogram is frequently required to demonstrate that the ureter is normal, since the obstruction may prevent its filling. The renal pelvis is dilated and the ureter normal. A stricture or high origin of the ureter may be concealed by the shadow of the dilated pelvis, only to be visible in an oblique pyelo-ureterogram. Accessory vessels may cause a sharply marginated, transverse filling defect in the ureter, but this, too, is ordinarily obscured by the overhanging renal pelvis. At times obstruction will be so complete that no contrast medium can be injected from below, but the pelvis in such a case may fill in a delayed excretory urogram. The renal end of the ureter may, when injected from below, show a typical deformity (figure ten).

Other pyelographic changes which are suggestive when present include a bifid pelvis and a squared pelvic outline, but one must guard against making the diagnosis in the absence of unmistakable hydronephrosis, lest he attribute to a normal kidney symptoms which are extrarenal in origin.

Treatment

Four courses of action are possible: Observation, non-surgical management, corrective operation, and nephrectomy.

Observation is preferred when symptoms are very mild or absent, and when a small hydronephrosis does not increase nor become infected during a long period of observation.

Non-surgical treatment is of no lasting value, except in the presence of an uncomplicated stricture, which may respond to repeated dilatations.

The inlying ureteral catheter, supplemented by therapy with antibiotics, is valuable when the obstructed kidney is acutely infected; its use may permit later performance of a plastic operation rather than nephrectomy.

It is difficult to set definite rules concerning the choice of a conservative operation over nephrectomy. Hinman states that, once a kidney has suffered real damage and its mate has undergone compensatory hypertrophy, the damaged kidney will receive no stimulus to function, and will atrophy despite a well executed corrective operation. However, many surgeons have reported instances in which the kidney functioned normally or was normal anatomically for periods ranging from fifteen to twenty-four years after operation.

Hinman has also stated that a damaged kidney which does not improve after repair may cause hypertension, but this does not appear to be borne out in our series.

Age is an important factor in the decision. While an elderly patient with a normal opposite kidney can gain little from a conservative operation since his normal kidney has proved itself, a child has to depend upon the opposite kidney for a long time. His greater capacity for repair also favors conservation of tissue. If there is any doubt about the integrity of the opposite kidney, however, an attempt to conserve its damaged mate may be indicated at any age. Since experiments indicate that an animal may live on a fraction of one kidney it may be desirable, especially in the very young, to try to preserve an organ in which as little as one-third to one-fourth of the normal renal substance remains.

Nephrectomy is required when small amounts of renal substance remain in older patients with normal opposite kidneys, especially when the remaining tissue is fibrous in consistency or yellowish in color from diffuse chronic infection.

All conservative operations should be designed to relieve obstruction at the ureteropelvic junction and, when the renal pelvis is large, to reduce its size sufficiently to render peristalsis effective, or at least to prevent pooling of urine in the diseased kidney.

Types of Operation

Trendelenburg in 1886 (figure eleven) excised a wedge from the opposed ureteral and pelvic walls in a hydronephrosis with a high origin of the ureter. The operation failed, but has since been used successfully by others.

The first successful operation was probably that of Küster who, in 1891 (figure twelve), cut and ligated a strictured ureteropelvic junction and reimplanted the ureter into the dependent portion of the renal pelvis. This operation has been widely used with and without modification by Wildbolz, Quinby, and others, despite the danger of stricture in the divided ureter. Lubash (figure thirteen) has sought to minimize this danger by splitting the end of the ureter before reimplantation, but has failed to remove the other and perhaps the theoretical objection that interruption of the continuity of the pelvis and ureter may impede peristalsis. Leaving a "button" of pelvis on the ureter when detaching it from the pelvis has also been recommended, but is not applicable when there is a lesion of the junction itself.

Fenger in 1894 (figure fourteen) incised the stricture longitudinally and sutured it transversely, but Herbst and Polbey subsequently showed that this procedure kinked the ureter and produced hydronephrosis in the dog.

In cases with a high origin of the ureter, Albarran and later von Lichtenberg (figure fifteen) made a lateral anastomosis between the pelvis and ureter, sometimes like a gastroenterostomy and sometimes like a Finney pyloroplasty, but this may give rise to an edematous spur which defeats the purpose of the operation.

Gayet (figure sixteen) resected wedges from the walls of the pelvis to reduce its size, but did nothing about the presumed obstruction itself, an omission which Young sought to correct by adding Fenger's plastic, the objections to which have been noted above. Priestley (figure seventeen) has improved Gayet's resection by slitting the lateral aspect of the ureter for a short distance and anastamosing the remaining pelvis to it.

When the obstruction is due to a long stricture, Davis divides it (figure eighteen) and closes the ureter loosely around a T tube, depending upon nature to finish the job. His results have been good.

Alleman has adapted the Fredet-Rammstedt operation for pyloric stenosis to ureteropelvic stricture, and similar methods have been advocated by Gibson and others but, in addition to being difficult of accomplishment because of the thinness of the ureter, this seems likely to invite recurrence.

The Schwyzer-Foley Y plasty (figure nineteen) has been the method of choice in most of the cases in this series because it is adaptable to practically all types of non-calculous obstruction at the uretero-pelvic junction, and because it does not interrupt the continuity of the ureter. Schwyzer adapted the pyloroplasty of Durante to the renal pelvis, and Foley improved it so as to make the ureteropelvic junction dependent. Foley makes the limbs of the V on the anterior and posterior surface of the pelvis, and pulls the broad triangular flap thus outlined into the vertical limb in the ureter. He uses a small rubber catheter as an ureteral splint, and a larger one as a pyelostomy, and

stresses the value of nephropexy as an adjunct to the plastic. He also emphasizes the importance of accurate suturing with 00000 chromic catgut on atraumatic needles.

Other points deserve discussion. The diagnosis must, for obvious reasons, be correct. Peripelvic fascial sheets and bands must be dissected off completely so that there are no remaining tags to stick together after operation and, by subsequent contraction, to reproduce the obstruction One should empty the renal pelvis at operation before estimating how much renal substance remains. Accessory vessels to the lower pole must be cut. Nephrostomy with a Malecot catheter seems more secure than pyelostomy with a Robinson catheter. The utility of an "ureteral splint" is doubtful except as a convenience during actual suturing. If nephropexy is necessary (it certainly yields a better looking postoperative pyelogram) the simple method of Deming is perfectly adequate.

Last (and perhaps most important) an earnest effort must be made during convalescence to prevent the entrance of urea-splitting organisms into the kidney, since this offers the greatest single threat to a successful operation, provided the diagnosis was correct and the operation well done.

Study of Cases

The material for this study consists of fifty-seven plastic operations upon the ureteropelvic junction in fifty-four patients (two had operations on both sides, and one had a secondary plastic after the first one failed) performed between April 1930 and December 1946. Not included in this study are those surgical cases of non-calculous obstruction at the ureteropelvic junction in whom the junction was not opened, nephrectomy was done, or in whom less than a year has elapsed since operation.

Two patients have not been seen since operation, so that results can be assessed in 55 operations on fifty-two patients. Tables two and three (five slides) summarize pertinent data concerning the patients and their operations.

Table II

Miscellaneous Data
(54 cases)

Age	2 to 55	average 27.4
Sex	male 25	female 29
Side	right 28	left 20
	both 6	

Causes of Obstruction

Lesion	Only Cause	Associated with others
Stricture	10	15
Neuromuscular	9	*14
Accessory vessels	3	23
Polyps	2	1
Pressure lower pole (?)	2	0
Fascial sheet	1	19
Fascial band	1	4
Granuloma	1	0

*Unable to force urine through manually after other factors removed.

Table III

Surgical Data
(54 cases)

Type of Operation	
Y-plasty	54
Kuester	2
Davis	1
Priestley	1
(2 bilateral, 2 repeated)	
Complicating Lesions of Urinary Tract	
Nephrolithiasis	4
Ureterectasis	2
Horseshoe kidney	1
Ectopic kidney	1
Solitary kidney (postoperative)	1
Supplementary Operations	
Resection pelvis	8
Pelviolithotomy	4
Resection lower pole	3
Division of isthmus	1

Questionnaires were sent to all patients, and those who had not been seen within the year were asked to come in for reexamination, including a brief history, urinalysis and culture, and urograms. The follow-up period varies from one to seventeen years.

Minor complications occurred in five patients but did not impair the end result. Two of these had rather severe febrile reactions apparently due to infarcts following ligation of accessory vessels to the lower pole of the kidney. Both recovered and have remained well for over eleven years. Another patient passed an unrecognized stone from the opposite ureter after leaving the hospital. A fourth developed a pseudoleukemia a few days after operation, but recovered after transfusions and a fifth recovered from pulmonary atelectasis and femoral phlebothrombosis.

Major complications occurred but were subsequently corrected by additional surgical measures in three patients, who have since remained well.

In the first of these a stone in a calyx was missed during a pelviolithotomy and Y-plasty for stricture, and was not discovered until the wound was healed and she was free of symptoms. The surgical removal of this stone some years later and the dissolution thereafter of recurrent calculi by irrigations with solution G were reported by Hamer and Mertz in 1944. They stated that the patient was well eleven months after dissolution of the stones.

In the second, a stone formed in the renal pelvis a few months after Y-plasty on the left; it was removed surgically. A year later a Y-plasty was performed on the right. A stone formed in this kidney also, but passed after cystoscopic manipulation. There are no stones nine years later! Both were due to postoperative infection with Bacillus proteus.

The third patient in this group had a Y-plasty in 1943 for a large hydronephrosis in a solitary kidney. Removal of the nephrostomy tube was followed by chills and fever with pain in the kidney. Conservative treatment having failed, the kidney was explored six weeks later, and the recurrent obstruction was seen to be due to a plastic periureteritis. A Davis intubated ureterotomy was done, and the splint left in place for six weeks, after which she was lost to follow-up. Four years later she returned with two renal calculi, a good-sized hydronephrosis, and infection with Bacillus proteus. Large doses of penicillin and streptomycin before and after pelviolithotomy sterilized the urine which remained so six months later despite an ill-advised pregnancy.

Failures

Complications or mistakes in technique resulted in failure in four more patients. In the first of these, a Robinson catheter used for nephrostomy slipped out a few days after Y plasty, and the brisk reaction to the ensuing urinary extravasation prompted an emergency nephrectomy, which, in retrospect, may have been unnecessary. Malecot catheters have since been used.

In the second, Y-plasty was done on a bifid pelvis, and the poorly placed nephrostomy drained only the lower segment. Although the patient left the hospital in good condition, a pyonephrosis later developed and necessitated nephrectomy.

In the third patient, Y-plasty was done on a grade 3 hydronephrosis; (figure twenty) accessory vessels to the lower pole crossed the renal pelvis well above the ureteropelvic junction at the conclusion of the operation and so were not cut because the opposite kidney was nearly functionless. No improvement followed (figure twenty-one) and exploration a year later disclosed that the artery had sunk so far into the pelvis as to occlude it. Obstruction persisted despite removal of the vessels. The patient still wears a nephrostomy tube ten years later. A plastic on the nearly functionless opposite kidney (figure twenty-two) was not followed by any improvement in function, so that these were two failures in one patient.

In the fourth failure, an excellent anatomic and functional result followed a right Y-plasty, but a postoperative infection with Bacillus proteus resulted in bilateral branched renal calculi which the patient has thus far declined to give up.

Uncertain Category

One man of 27 had an ureteral stricture and hydronephrosis on the left; Y-plasty was successful but he returned a year later with an acute right sided pyelonephritis with calculi, urine from the left being sterile. Death followed an emergency pyelostomy; the left kidney (figure twenty-three) was as normal as possible after a plastic operation. Obviously, this patient did not die from the successful Y-plasty, but would not have died had it not been done, because the infecting organism (again Bacillus proteus) gained access to the urinary tract through the nephrostomy tube after the plastic.

To summarize, there were eleven failures in 55 operations (20%) or eight in 52 patients (15%).

The primary causes of failure were:	
Post-operative infection by Bacillus Proteus	5
Technical mistakes	4
Error in judgment (attempt to save functionless kidney)	1
Excessive post-operative scarring	1
	11

It is perhaps a hopeful sign that all but the last of these factors in failure is preventable, and that the last known failure occurred four years ago. The fact that three of the failures were subsequently corrected by secondary operations cannot be used to eliminate them from the original classification, but by deceiving oneself only slightly, it is possible to reduce the failures to 5 in 52 patients (10%).

Successes

It is difficult to be concise in evaluating the varying degrees of success which have been attained mainly because of the necessity for depending upon patients' statements. Fifty-two patients have been followed for from one to fifteen years. Forty of these have had urograms from one to fifteen years later (average $5\frac{1}{2}$ years); others have been examined at least a year postoperatively, but have not had x-rays more than six months after operations; the remainder have responded to a questionnaire within the last four months.

Thirty patients (58%) have no symptoms at all. Twelve patients (23%) have minor symptoms (backache on exertion, pyuria) but feel that the result has more than justified the inconvenience of the operation. Thus 42 (81%) are unquestioned successes. Two more patients have occasional backaches and doubt that the operation was worthwhile, although both have excellent pyelograms and sterile urine $3\frac{1}{2}$ and $6\frac{1}{2}$ years after operation.

It is noteworthy that a pronounced dilatation of the ureter has disappeared in the first of these patients, (figures twenty-four to twenty-seven).

On the other hand, several patients have hydronephroses as large as they were before operation, yet are happy at the outcome, (figures twenty-eight and twenty-nine). Obviously, the obstruction was relieved effectively, but the renal pelves had lost their power to contract. It is interesting to speculate whether reducing the size of the pelvis by resection at the time of operation would have contributed more than a better looking post-operative pyelogram. Two more pairs of pyelograms are shown as examples of results which are excellent pyelographically in patients who have sterile urine and who are symptom-free (figures thirty-two to thirty-five).

It was hoped to be able to present convincing data on the use of the ureteral splint. It was used thirty-five times with eight failures. The splint was omitted twenty-two times. Three of these were lost from follow-up. Seventeen were successes, while two were those presented above with excellent

pyelograms and sterile urine, and who are dissatisfied. While the number of cases involved is small, it seems safe to conclude that the splint can be omitted without increasing the chances of failure.

It is evident that the two greatest hindrances to success, given a correct diagnosis and sufficient functioning renal substance, are postoperative infections with Bacillus proteus and errors in technique. The former can be avoided most effectively by omitting postoperative diversion of the urine--a procedure which seems unsafe when a plastic has been done--or by painstaking care of the nephrostomy tube and by the judicious postoperative use of antibiotics and antiseptics. (The last stone in this series followed an operation done four years ago -- before penicillin and streptomycin).

The latter can be avoided by closer attention to details: Placing the nephrostomy (using two if need be) so that it drains the whole kidney and cannot slip out; dividing all polar vessels even if, at the end of operation they seem so placed as to be incapable of causing trouble, and taking films during operation after stones have been removed.

One must point out that there are occasions, especially in children, where it is desirable to take chances, i.e., to repair a kidney of doubtful value in the hope that some measure of useful renal function will be salvaged. Failure in such circumstances is no disgrace.

Summary and Conclusions

1. The history of plastic operations for non-calculous obstruction at the ureteropelvic junction has been reviewed.

2. Fifty-seven operations in 54 patients have been reported.

3. Success was obtained in about 81 per cent of the 52 cases followed. The results thus exceed those of nephrectomy by a margin of 81 per cent.

4. Failure was due to postoperative infections with Bacillus proteus, to technical blunders, and to errors in judgment.

5. Ways and means of preventing failures have been discussed.

References

1. Alleman, R.
Zur Klinik und chirurgischen Behandlung kleiner schmerzhafter Hydronephrosen.
Ztschr.f.Urol.35:414-422, '35.

2. Aragona, G.
Contributo allo studio della idronefrosi, secondaria a valvole ureteriche congenite.
Pathologica, 28:504-507, '36.

3. Bazy, P.
De l'urétéro-pyélo-neostomie,
Bull.et mém.Soc.nat.de chir., 54:313-320, '28.

4. Davis, D. M.
Intubated ureterotomy.
Tr.An.Assn.G-U Surg., 36:21-43,'43.

5. Deming, C. L.
Nephroptosis: Causes, relation to other viscera, and correction by a new operation.
Jour.A.M.A., 95:251-257, '30.

6. Deming, C. L.
Ureteropelvic obstructions due to extrinsic and intrinsic lesions of the ureter.
J.Urol.,50:420-431, '43.

7. Fenger, C.
Operation for the relief of valve formation and stricture of the ureter in hydro- or pyonephrosis.
Jr.A.M.A., 22:335-343, 1894.

8. Foley, F. E. B.
New plastic operation for stricture at ureteropelvic junction; report of twenty operations.
J.Urol.,38:643-672, '37.

9. Gayet, G.
Resection orthopédique du bassinet.
J.d'urol., 1:625-632, '12.

10. Gibson, T. E.
Classification and plastic repair of ureteropelvic obstruction.
Surg.Gyn.& Obst.,80:485-496 (May)'45.

11. Hamer, H. G. and Mertz, H. O.
Disappearance of renal calculi following the employment of solution G.
Tr.AmAssn.G-U Surg.,37:115-121, '44.

12. Henline, R. B. and Menning, J. H.
Management of hydronephrosis due to ureteropelvic obstruction.
J.Urol.50:1-24, '43.

13. Herbst, R. H. and Folkey, H. J.
Fenger's ureteropyeloplastic operation.
J.Urol.23:23-31, '30.

14. Hinman, F.
Renal counterbalance.
Arch.Surg., 12:1105-1223, '26.

15. Hinman, F.
Hydronephrosis and hypertension.
Surg., 17:845-849 (June) '45.

16. Jewett, H. J.
Accessory renal vessels.
Surg.,Gyn.& Obst., 68:666-676, '39.

17. Keyes, E. L., Jr.
Problems concerning urinary calculi.
Am.J.Med.Sc., 161:346-347, '21;
(Result in this case reported in discussion of Davis' paper (see above).

18. Küster,
Ein Fall von Resektion des Ureters.
Arch.f.klin.Chir.,44:850-54, 1892.

19. Legueu, F.
La motricité du bassinet.
J.d'urol., 24:61-67, '27.

20. Lubash, S. and Madrid, A.
Ureteropyeloneostomy for hydronephrosis.
J.Urol.38:634-642, '37.

21. Östling, K.
Genesis of hydronephrosis, particularly with regard to changes at ureteropelvic junction.
Act.Chir.Scand.,(supp.72) 86:1-122,'42.

22. Ponfick, E.
Über Hydronephrose des Menschen, auch im Kinder - und Sauglinsalter.
Beitr.z.path.Anat.u.z.allg.Path., 50:1-70, '11.

23. Priestley, J. T.
Conservative surgical treatment of non-calculous hydronephrosis.
Surg.,Gyn.& Obst.,68:832-841.

24. Quinby, W. C.
Factors influencing the operative procedure in hydronephrosis.
Jour.A.M.A., 93:1709-1710, '29.

25. Schwyzer, A.
The clinic of Dr. Arnold Schwyzer.
Surg.Clin.North America, 3:1441-1475, '23.

26. Trendelenburg.
Quoted by Küster (see above).

27. Van Duzen, R. E.
Nephroptosis producing duodenal symptoms.
J.Urol., 58:304-308, '47.

28. von Lichtenberg, A.
Hydronephrosis.
Am.Jr.Surg.,7:747-756, '29.

29. Walters, W. and Braasch, W. F.
Urinary obstruction and hydronephrosis.
Jr.A.M.A., 93:1710-1716, '29.

30. Wildbolz, H.
Dauererfolge organerhaltender, plastischer Operationen bei Hydronephrose.
Ztschr.f.urol.Chir., 31:63-88, '30-'31.

31. Young, J. H.
Obstruction to the ureter produced by aberrant blood vessels.
Surg.,Gyn.& Obst., 54:26-38, '32.