THE COMPARATIVE VALUES OF RETROGRADE AND INTRAVENOUS UROGRAPHY

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The historical background for the visualization of the urinary tract by means of the injection of an opaque medium is well known from the time of von Lichtenberg's[1] pyelography to the present era of intravenous urography. However, one incident of experimentation in the evolution of this diagnostic procedure should be borne in mind in every discussion of the subject, and that is the work of Osborne, Sutherland, Scholl, and Rowntree,[2] who in 1923 performed intravenous pyelography using sodium iodide. Owing to the imperfections of their preparations, however, they were unable to make the procedure practical.

The preparations which are in use at the present time are stable, organic iodide compounds. The first of these was selectan neutral which was introduced by Binz and Rath[3] in 1925 for the purpose of combating coccus infections. By the intravenous use of this agent they were able to visualize the urinary tract and this led to further efforts to obtain a product of less toxicity which would be capable of greater concentration. Roseno[4] came forward with pyelognos, which however, was not satisfactory, and it was left for Swick,[5] of New York, to perfect a preparation which he called uroselectan. This preparation proved to be of practical application and immediately intravenous pyelography became a prominent roentgenologic procedure. Since then the preparations of skiodan and abrodil have been brought into use. These contain 52 per cent of iodine as compared with uroselectan which contains only 40 per cent. The latest preparation, neo-iopax, is in solution and may be injected directly from the sealed ampoule.

It is possible by means of these newer preparations to use an injection of 20 gr. as against the 40 gr. necessary with the former preparation. The total quantity of solution used in each instance, however, is 100 c.c. which is injected by the gravity method. In our experience no untoward reaction has followed this procedure.

These later preparations are excreted more rapidly which necessitates taking films immediately after the injection and at more frequent intervals than was necessary with the old preparations.

Urography by the intravenous method is a practical procedure with almost no contraindications except in cases of glomerular

nephritis where excretion is at the minimum. By this method the entire urinary tract may be visualized. A very accurate determination may be made of the integrity of the kidney and its ability to excrete through the glomeruli, amounting to virtually a visual estimation of kidney function.

While this method does not give a precise result, von Lichtenberg states that it is satisfactory for clinical interpretation and judgment of a surgical lesion. Perhaps a fair estimate of elimination is about 90 per cent in the first hour, and in cases in which no concentration is shown in the first half hour, the kidneys may be definitely considered to be functionally impaired.

Intravenous urography then becomes a wonderful complement to cystoscopy and should be considered as an adjunct to the older methods of examination. On the other hand, its indiscriminate use as a short cut to diagnosis must be condemned, and it should in no sense be considered as comparable with pyelography by the catheter method; but its use is definitely indicated where retrograde pyelography can not be done, or where both kidneys are to be investigated and bilateral injection is contra-indicated.

The visualization of the kidney pelvis and ureters by intravenous urography is of necessity only a functional process and may be compared to the colon examination made after an ingested opaque medium which usually shows the colon partly filled in contrast to that in which the colon is completely filled with a barium enema. This at once gives us some idea of the comparative difficulties in interpretation, particularly in the case of the normal kidney, when perhaps only 50 per cent are filled sufficiently to rule out disease.

It would seem then that catheterization and injection of the kidney pelvis and ureters is the method of choice in the vast majority of pyelographic examinations, as by this method specimens may be obtained from both sides, which is particularly advantageous in cases of infection.

There are many cases, however, in which catheterization is impossible or at least impractical. These might be divided broadly into three classes: (1) cases in which anatomical or pathological conditions preclude cystoscopy, (2) when obstruction prevents injection of the solution beyond the point of obstruction, and (3) those cases in which instrumentation becomes a risk to the patient. To enumerate some of these conditions more explicitly we would first mention cases in which the ureters have been transplanted into the colon; cases of ureteral obstruction, such as a large stone; stricture of the ureter; or tumor of the ureter (in many of these cases it is

extremely important to know something of the condition of the kidney and ureter above the point of obstruction); diverticulosis of the bladder in which the ureter opens into the diverticulum and the introduction of a ureteral catheter is impossible; extensive papillomata or other tumors of the bladder, which obscure the ureteral orifice; enlarged prostate or stricture of the urethra, making cystoscopy impossible; the presence of only one kidney, either a congenital solitary kidney or a single kidney left after nephrectomy (in these cases the urologist many times hesitates to do a pyelogram on the only remaining kidney); cases of marked cystitis with edema of the bladder wall, sometimes with marked hematuria; tuberculosis of the kidney in the presence of which many authors consider it inadvisable to do bilateral pyelography.

Many times the suspected kidney may be examined by retrograde pyelography and the pathology definitely determined, yet it becomes of importance to determine the kidney function and the possibility of a similar infection in the opposite kidney. In many instances this can be very nicely done by intravenous urography. Anomalies of the kidneys and ureters may be very well demonstrated by this method, particularly polycystic kidneys which are usually bilateral and have a rather poor function; also in the case of nervous individuals where cystoscopy can not be performed without anesthesia. In the urologic conditions of childhood, intravenous urography should at least be the first procedure to be attempted and in most instances will give very definite information as to the condition of the urinary tract.

Many authors have cited hydronephrosis as an ideal condition for the demonstration of intravenous iodide. I wish to call your attention to the fact that most hydronephroses are of an intermittent type and unless such an examination is done at the time of actual obstruction there will be little or no retention and the amount of hydronephrosis present either will be missed entirely or be vastly underestimated.

Interpretations of urograms made by intravenous urography embody most of the principles of diagnosis or interpretation which are obtained by retrograde pyelography. There is this difference, however, that by the former method only the urine contained iodide is seen in the functional process and peristalsis may empty a single calyx or the ureter and thereby cause filling defects which may be interpreted incorrectly. To avoid this, a considerable number of films should be made as is done in a study of the duodenum after barium in an attempt to get a well filled duodenal bulb.

As previously stated, great care should be exercised in estimat-

ing the amount of hydronephrosis present in a given case or in deciding the presence of a moderate hydronephrosis which is often seen in ptosis of the kidney or any early obstruction of intermittent character as the kidney may be functioning well at the time of such an examination. The same applies to the extensive infection of the kidney with poor function. Calculi may be accentuated and more easily visualized by this method as compared with their complete obliteration in retrograde pyelograms. The anomalies are well determined and offer no great difficulty of interpretation.

Summary

I feel that with some experience the findings from intravenous pyelograms, ureterograms and cystograms will offer only moderate difficulty. One may be discouraged by many unsatisfactory examinations but by perseverance these difficulties will be overcome, as has been the case in cholecystography due to improvement in technic and careful attention to details.

Intravenous urography, then, has added a very valuable method to our urological diagnostic armamentarium and has come to be a practical roentgenologic method of examination in cases in which a pathological condition in the urinary tract is suspected.

References

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