

SIMPLIFIED OPERATIVE NEPHROSCOPY

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ABSTRACT — *Intraoperative nephroscopy is a valuable and practical adjunct to renal surgery. A simplified methodology is described using familiar cystoscopic equipment and techniques. Its particular usefulness in the definition of small radiolucent defects of the renal collecting system is illustrated.*

Intraoperative nephroscopy is a technique for endoscopic visualization of the renal pelvis and calyceal system. When operation is indicated, it can be a valuable means of assisting in the diagnosis and treatment of calculi and lesions in the renal collecting system. As originally described by Trattner,¹ standard endoscopic equipment and maneuvers were used to perform the intrarenal inspection and manipulations. Modifications of this equipment and technique have generated a more elaborate procedure and may have reduced its practicability for routine use.²⁻⁴

We have found intraoperative nephroscopy to be a valuable and practical adjunct to open renal surgery. By using routine cystoscopic equipment and techniques, the method has been simplified and is adaptable to a number of operative situations. It is particularly helpful in the definition of small radiolucent filling defects of the renal collecting system in which there is a suspicion of neoplasm. The following cases are presented to illustrate this usefulness and to describe the simplified technique.

Operative Nephroscopic Technique

At the University of Michigan Medical Center, intraoperative nephroscopy has proved to be a valuable adjunct to the diagnosis and treatment of renal pelvic and collecting system lesions. Believing that a simplified system would be most practical, we have streamlined the techniques described by Trattner and utilize only the instruments and irrigating system that are standard for cystoscopy and with which we are most familiar.

The instrument ordinarily used is a 24 F McCarthy panendoscope with a straight sheath fitted with water and lighting conduits in a fashion identical to that used during cystoscopy. Biopsy forceps and fulgurating electrodes are available as needed.

At operation the kidney is exposed and mobilized completely. The instrument is carefully inserted through a small pyelotomy incision on either the anterior or posterior surface of the pelvis. No attempt is made to prevent leakage of irrigating fluid, but the wound is carefully packed with pads, and the fluid is suctioned off as soon as it appears. Inspection of the pelvis, infundibula, and calyces is performed while low pressure irrigation into the pelvis provides for a clear view. The movements of the instrument are similar to those performed during cystoscopy and are in concert with manipulation of the kidney to permit inspection of all the collecting system ramifications. Biopsy and fulguration capabilities are utilized as needed.

Case Reports

Case 1

A fifty-nine-year-old woman was admitted for evaluation of gross hematuria and right flank pain. Urologic history was negative except for previous urinary tract infection. Physical examination revealed costovertebral angle tenderness on the right but was otherwise normal. Results of renal function tests were normal. Urine analysis showed numerous red blood cells but no white

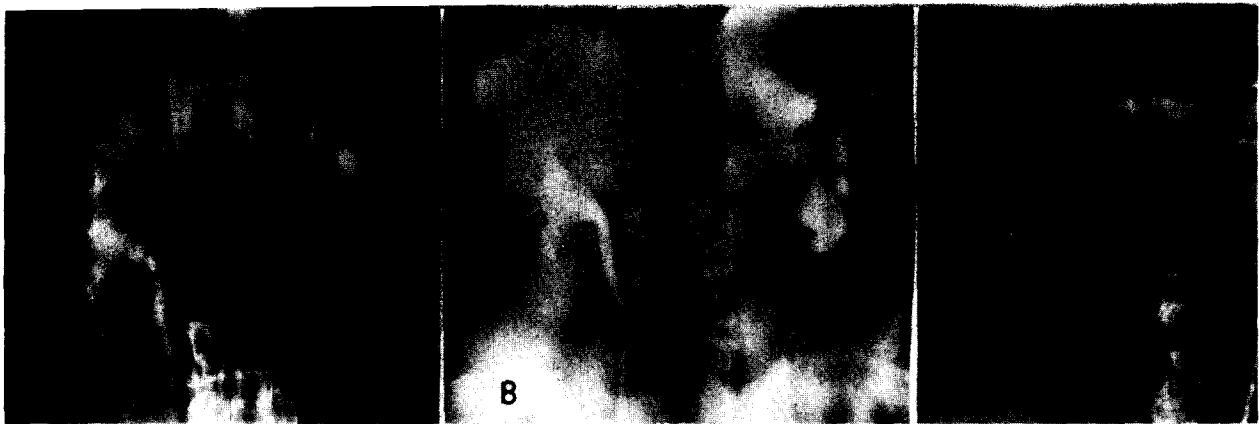


FIGURE 1. (A) Intravenous pyelogram demonstrates two radiolucent defects along superior margin of right renal pelvis; left ureteropelvic junction obstruction is present. (B) Laminagraphy confirms renal pelvic lesions. (C) Selective renal arteriogram normal.



FIGURE 2. (A) Intravenous pyelogram suggests sessile lesion along superior margin of left renal pelvis. (B) Lesion confirmed by laminagraphy. (C) Normal left selective renal angiogram.

blood cells or bacteria per high-power field. Intravenous pyelography demonstrated two radiolucent filling defects near the superior margin of the right renal pelvis. A left ureteropelvic junction obstruction unchanged from previous films was also noted (Fig. 1A). These filling defects were confirmed by laminagraphy and retrograde pyelography (Fig. 1B). Cystoscopy was normal. Results of urinary cytologic study were suspicious but not diagnostic for a transitional cell neoplasm. A renal arteriogram was normal (Fig. 1C).

The patient underwent flank exploration at which time the external appearance of the kidney was normal. After mobilization of the kidney a number 24 F panendoscope was inserted through a posterolateral pyelotomy. Inspection of the area in question showed it to be free of tumor and stone, but two arterial pulsations were seen to account for the filling defects. The pyelotomy incision was closed, and the patient made an uneventful recovery.

Case 2

A fifty-five-year-old man with urinary retention was admitted. Physical examination was normal except for an enlarged bladder. Laboratory data revealed urinary infection and normal renal function studies. Intravenous pyelogram demonstrated a sessile lesion along the superior margin of the left renal pelvis (Fig. 2A). Laminagraphy (Fig. 2B) and retrograde pyelography corroborated the presence of this lesion. Cystoscopy revealed a trabeculated bladder with outlet obstruction but no neoplasm. Urinary cytologic study was positive for transitional cell carcinoma. Selective left renal arteriography was normal (Fig. 2C).

The left kidney was grossly normal at the time of left flank exploration. After adequate mobilization a number 24 F panendoscope was inserted through a posterior pyelotomy. An exophytic lesion, atypical for transitional cell carcinoma, was identified endoscopically. Using the biopsy forceps, tissue fragments were removed and sent for

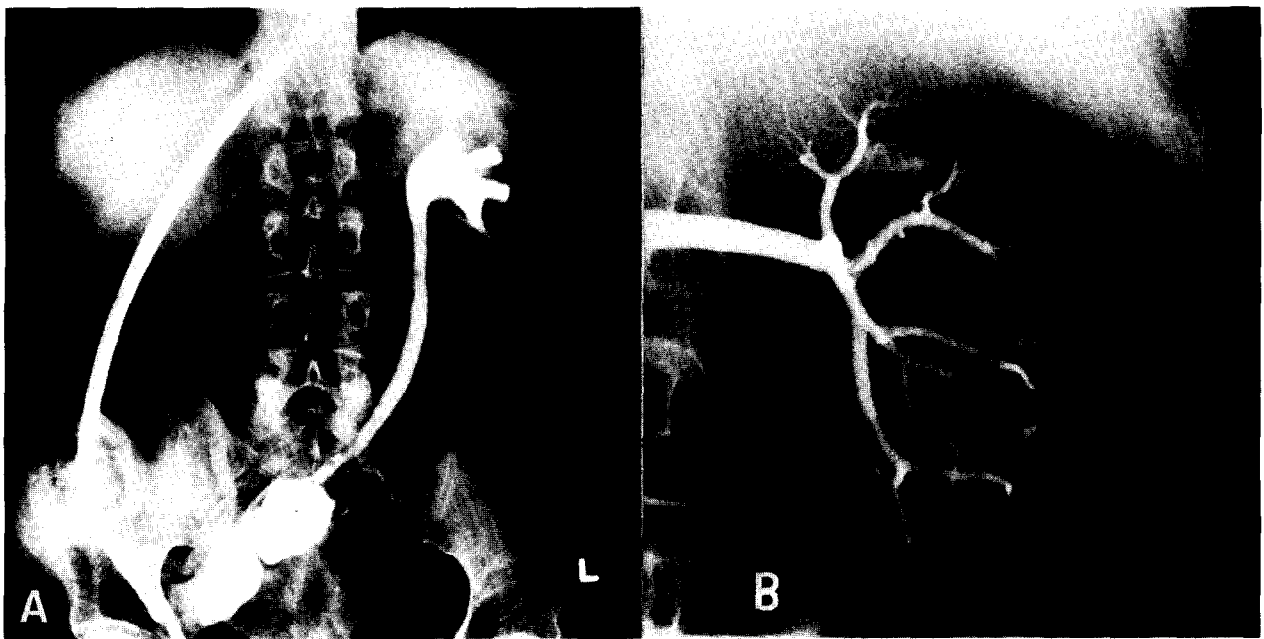


FIGURE 3. (A) Retrograde ureteropyelography utilizing fiberoptic pediatric gastroscope demonstrates papillary mass projecting from upper pole infundibulum. (B) Selective left renal arteriogram is normal. Pyelographic phase confirms filling defect in upper pelvis.

pathologic study. The lesion proved to be an exudative and proliferative benign inflammatory mass with no evidence of neoplasm. Further endoscopic inspection of the pelvis was unremarkable. The pyelotomy was closed, and the patient had an uneventful postoperative course. The patient has been followed endoscopically and pyelographically at three monthly intervals; urinary cytologic specimens have been negative, and no evidence for neoplasm exists.

Case 3

A sixty-nine-year-old man was admitted for evaluation of gross hematuria. Four years prior to admission he underwent cystectomy and ileal loop urinary diversion for invasive transitional cell carcinoma of the bladder. The patient was otherwise asymptomatic and free of metastatic disease. Renal function tests were normal. Intravenous pyelogram with laminagraphy suggested a filling defect in the left renal pelvis. Using a fiberoptic pediatric gastroscope to catheterize the left ureteral orifice, retrograde pyelography disclosed a small papillary mass projecting from the upper pole infundibulum (Fig. 3A). Left renal arteriogram showed the renal vasculature to be normal and confirmed the presence of a pelvic filling defect during pyelographic phase (Fig. 3B). Results of urinary cytologic study were negative.

The patient underwent exploration of the left kidney which appeared normal to external inspection. Nephroscopy through a posterior pyelotomy

revealed a small exophytic mass at the origin of the upper pole infundibulum which was not typical for transitional cell tumor. Frozen sections of biopsy material revealed inflammatory tissue and a fibrinopurulent exudate without evidence of neoplasm. The procedure was terminated, and the patient was treated with antibiotics. He is currently free of neoplasm.

Case 4

A fifty-five-year-old woman underwent cystectomy and ileal loop diversion for invasive transitional cell carcinoma of the bladder. Three months postoperatively an intravenous pyelogram demonstrated the interval appearance of a left renal intrapelvic mass. Repeat intravenous pyelogram performed one month later was again abnormal, and recurrent transitional cell carcinoma was suspected. Results of urinary cytologic study were negative. Renal function studies and hemogram were normal.

Exploration of the left kidney was performed, and nephroscopy through a posterior pyelotomy revealed no neoplasm. Prominent arterial pulsations were seen within the pelvis, and contiguous mucosal erosions with submucosal hemorrhage were noted. The procedure was terminated, and the patient has since been asymptomatic and free of tumor.

Comment

Endoscopic visualization of the renal pelvis and collecting system is not a new technique. In 1941

Rupel and Brown⁵ introduced a method of endoscopic examination of the renal pelvis and described its usefulness in extracting stone fragments from the collecting system. Trattner¹ elaborated on this and in 1948 presented both the instrument and the operative methodology necessary to visualize the entire intrarenal collecting system systematically. He utilized a straight 24 F sheath with different telescopes for observation, operation, and catheterization. Forward, foroblique, and right-angled lens were utilized to permit systematic inspection of the renal pelvis, infundibula, and calyces.

Attempts to modify these basic techniques of nephroscopy have evolved along two lines: (1) Fiberoptic ureteropyeloscopy performed via retrograde ureteral catheterization is a recently developed, less traumatic method for endoscopic renal evaluation.⁶ Unfortunately, the technique is handicapped by poor image quality (relative to modern cystoscopy) and lack of biopsy capability. (2) More specialized right-angled instruments have been advocated to improve the ease with which intrarenal inspection may be accomplished.²⁻⁴ Equipped with operating and biopsy accessories, these instruments provide satisfactory visualization of the intrarenal collecting system and effective manipulative functions. Unfortunately, the right-angled instrument modification may be impractical for the practicing urologist. In addition to requiring the purchase of specialized equipment, the right-angled instruments demand a period of familiarity which may be accomplished best on cadaver kidneys or fresh surgical specimens.

Intraoperative nephroscopy has been particularly useful in our hands in the definition of small radiolucent lesions of the pelvicalyceal system in which a neoplasm is suspected but cannot be proved. It is precisely when these lesions are small and difficult to diagnose definitively that they would be most amenable to local or radical extirpation were they a neoplasm. Under these circumstances, retrograde pyelography may only confirm the presence of a lesion without defining malignant characteristics. Likewise, arteriography may be stressed to its upper limits of resolution, and, rather than excluding malignancy, a normal angiographic study may indicate the absence of invasion and define an operable lesion. Urinary cytologic specimens and brushings are often informative, but the frequency of false positive and negative results reduces their specificity. Often, clinical events such as hematuria, flank pain, or prior urothelial malignancy provide in-

criminating evidence, and renal exploration is deemed necessary to exclude a neoplasm. To wait and watch for growth or evidence of invasion is unacceptable in that the chance for cure may be significantly compromised. Equally unacceptable is radical surgery for a benign inflammatory lesion, calculi, or no lesion at all.

In each of the 4 cases presented, we were faced with a radiographic abnormality compatible with a tumor and either clinical or laboratory data that were highly suspicious for a neoplasm. Exploration of the kidney was judged essential to exclude neoplasm, but because of the location and/or size of the apparent abnormalities, visual inspection or palpation was inadequate. Intraoperative nephroscopy provided a means of visually assessing each apparent abnormality and obtaining biopsy material when needed. In each case, we were able to determine precisely the cause of the radiographic abnormality.

In none of the cases was a neoplasm present, and, fortunately, the correct diagnosis precluded an extirpative procedure. One must question, however, what increased risk, if any, this procedure would pose in terms of extrarenal spillage and spread of malignancy if a neoplasm were present. We may only speculate that with proper wound protection the chance of tumor spillage would be small and probably no greater than the risk of spread during segmental ureteral or bladder tumor excision or from cyst puncture of a malignant renal mass.

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