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PERCUTANEOUS STONE MANIPULATION

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ABSTRACT

Percutaneous stone manipulation by direct ultrasound disintegration, extraction or chemolysis was done on 34 patients. A total of 15 patients presented with an operatively established nephrostomy, while percutaneous nephrostomy and subsequent dilation of the nephrostomy channel were done in 19. The rate of complete stone clearance was 19 of 20 stones after percutaneous nephrostomy and 8 of 16 stones in the group with an operatively established nephrostomy. The primary goal, to remove obstructing pelvic stones, was achieved in all cases. There were no untoward side effects, such as back pressure damage owing to flushing of the collecting system during ultrasound disintegration, or persistent infection. Complications in 3 patients were managed conservatively.

In 1955 Goodwin and associates first described percutaneous nephrostomy as a simple technique of establishing access to the collecting system of the kidney.[1] The idea did not attain widespread acceptance until about 15 years later. Since then, numerous reports on percutaneous nephrostomy and our own experience with >400 cases have documented its low morbidity and applicability for a growing number of indications. In 1976 Fernström and Johansson first described removal of kidney stones after percutaneous nephrostomy.[2] However, they as well as others who reported on stone removal via a pre-existing nephrostomy were not able to remove stones larger than the diameter of the nephrostomy channel. This problem can be solved by instrumental disintegration of the stone within the renal pelvis or by local chemolysis. We herein report on our experience with percutaneous stone manipulation in 38 patients since April 1976.

TECHNIQUE

Stones were removed by simple extraction, ultrasound disintegration, chemolysis or a combined procedure. Percutaneous nephrostomy was done with the patient under local anesthesia and with fluoroscopic or ultrasound guidance. Urine was aspirated for culture and appropriate antibiotics were given. The caliber of the first nephrostomy tube usually was 10 to 16F. For intrarenal instrumentation the nephrostomy channel was dilated up to 26F in 1 week. Dilation by a set of specially designed metal dilators was done with the patient under local anesthesia. The 26F tube with multiple side holes was left in place for 5 to 6 days to establish a firm nephrostomy channel.

Baskets, forceps, loops and so forth were used for simple stone extraction. Large stones were disintegrated by an ultrasound lithotrite[3, 4] originally developed for the removal of bladder stones.‡ An electrohydraulic lithotrite§ was used without sequelae in 1 patient. Depending on the general health status of the patient intrarenal stone manipulation was done with the patient under general anesthesia in 7 cases, peridural anesthesia in 10 and without anesthesia in 7.

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Chemolitholysis of uric acid stones was done with sodium bicarbonate. Hemiacidrin was used for struvite/apatite stones, regarding the necessary precautions.[5]

PATIENT MATERIAL AND INDICATIONS

Percutaneous stone manipulation was attempted in 38 patients. The collecting system could not be engaged in 3 patients because of improper dilation of the nephrostomy channel (2 patients) and dislocation of the nephrostomy (1 patient). In 1 patient an upper ureteral stone could not be manipulated into the renal pelvis for disintegration. These 4 patients finally underwent an operation. Of the remaining 34 patients (36 renal units) 14 had a solitary kidney.

Of 16 patients in whom percutaneous stone manipulation was done as a deliberate alternative to an open operation 9 initially were hospitalized because of fever and/or hydronephrosis owing to obstructing stones (table 1). In these cases percutaneous nephrostomy was an emergency procedure. Stone removal was done after stabilization by decompression and antibiotic treatment.

Only 2 patients had a clear contraindication to an operation because of cardiopulmonary diseases (figs. 1 to 3) but several had multiple problems related either to the stone disease or general health status, which finally led to the decision for intrarenal manipulation.

RESULTS

Hospitalization for stone extraction ranged from 4 to 30 days. Mean time of intrarenal manipulation was 68 minutes. Two patients required a second procedure for further stone disintegration and in 4 patients residual calculi were extracted mechanically in a second procedure.

In the group with pre-existing nephrostomy 8 of 16 kidneys were cleared completely (table 2). However, the aim of the procedure usually was to remove stones that obstructed urinary outflow (fig. 4). This aim was achieved successfully in all cases. Chemolysis was unsuccessful in 3 renal units. One patient refused treatment after 6 days of chemolysis with hemiacidrin without side effects. In 1 patient the entire collecting system was lined with stone fragments after pyelonephrotomy for a staghorn calculus composed of calcium oxalate and calcium phosphate. Hemiacidrin showed no effect and removal was not

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TABLE 1. *Indications for percutaneous stone manipulation in 34 patients*

	Pre-Existing Nephrostomy	Percutaneous Nephrostomy
Residual stones after operation	5	1
Recurrence after multiple or difficult previous operations	7	3
Deliberate alternative to an open operation	3	13
Contraindication to an operation	–	2

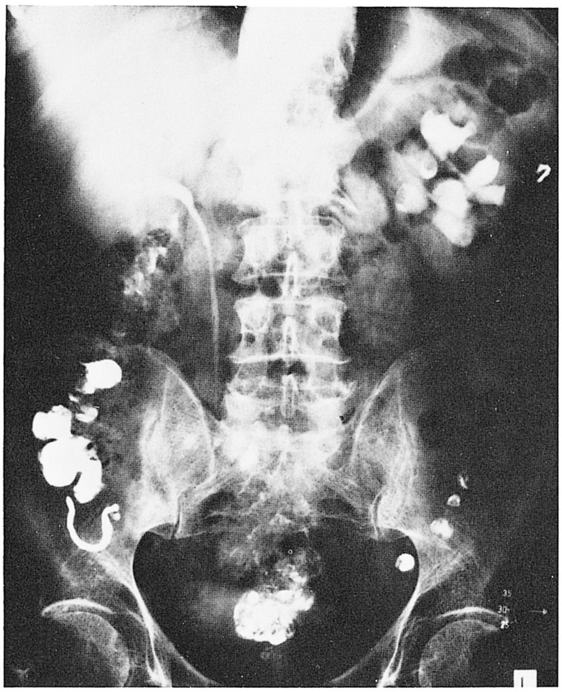

FIG. 1. Case 5. IVP of 66-year-old patient shows calicectasis of left kidney owing to obstructing stone. Patient had contraindication to operation because of chronic pulmonary distress.

possible because of the widespread distribution of the fragments in the whole collecting system. A matrix stone in a solitary kidney withstood chemolysis with trypsin and finally was extracted mechanically.

Only 1 patient in the percutaneous nephrostomy group had a residual caliceal stone 5 mm. in diameter. The patient had been hospitalized because of an obstructing pelvic stone in a solitary kidney that caused fever. In this emergency situation we did not attempt to pass the nephrostomy tube along the caliceal stone, so that it subsequently could not be reached by the ultrasound probe during successful disintegration of the pelvic stone.

Stone analysis in patients treated with ultrasound disintegration revealed nearly equal frequency of oxalate or struvite stones (table 3). The latter are more amenable to ultrasound disintegration because they can be disintegrated virtually to dust, whereas oxalate-containing stones disrupted frequently into smaller particles requiring further disintegration.

Infection was present in all 16 renal units with permanent or temporary nephrostomy before the procedure and remained in 11. Infection was documented in 16 of the 20 renal units that were treated primarily by percutaneous nephrostomy. There were 17 renal units not infected during followup.

Renal function. Of the 13 patients in whom stones were manipulated by ultrasound disintegration preoperative and postoperative values of ^{131}iodine-hippuran split clearance were available in 8. Only 1 patient with bilateral stones (case 1) showed a decrease of total renal function after manipulation (table 4) but the change was interpreted as inconclusive in view

FIG. 3. Case 5. Plain film and IVP 6 weeks after ultrasound disintegration of calcium oxalate calculus.

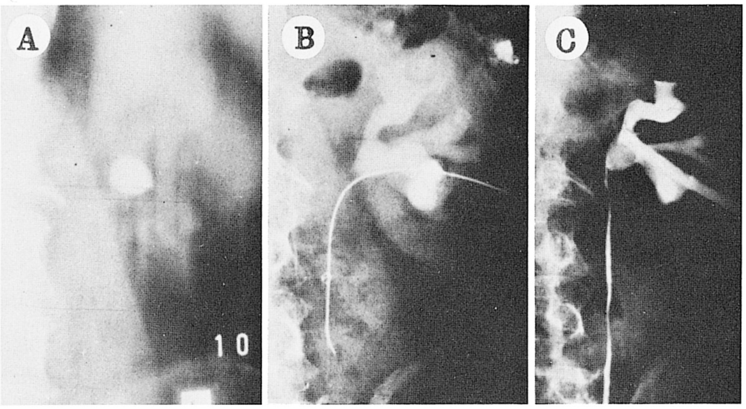

FIG. 2. Case 5. *A,* plain film shows calculus in renal pelvis. *B,* J-guide wire passes stone after percutaneous puncture. *C,* anterograde pyelography shows already partially collapsed collecting system with 26F nephrostomy in place after dilation.

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