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Treatment of the Multiple Small Stone Particles (Steinstrasse) in the Lover Ureter After the Extracorporeal Shockwave Lithotripsy (ESWL) Treatment

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Abstract: ESWL is an effective and noninvasive method of treatment for patients with urinary stones. However, especially in the treatment of larger stones impact of the small stone particles in the lower ureter (steinstrasse) is a serious complication that affects the result of the procedure. If the renal unit has not been catheterized before the ESWL procedure, removal of these particles by open surgical or endoscopic intervention within a very short time is mandatory. A total of 1576 renal unit were treated by ESWL with the Dornier MPL 9000 lithotripter from April 1991 to April 1995. Steinstrasse was observved in 81 patients (5.1%). Of these 81 cases stone fagments passed spontaneously in 56 (69.1%) and were treated successfully with repeat ESWL in 6 (7.4%), ureteroscopic management 14 (17.3%) or open ureterolithotomy in 5 (6.2%). In the treatment of steinstrasse, treatment modality depends on the factors as location and siz e of the fragment, leading larger fragment with following multipl sandy particles and existence of septic symptoms requiring emergency treatment. Prevention is important and recognition that percutaneous nephrostomy, debulking procedures and Double-J stent do not always prevent steinstrasse. Cautionary approaches include maximum debulking before ESWL, attention to the amount of stone burden treated at a single ESWL session and careful timing in cases with significant bilateral disease.

Introduction

German urologists have introduced a new term into urology, steinstrasse, to describe postlithotripsy cases in which multiple sone fragments lined up in the ureter. The obstruction may be due to a single large fragment (>5mm) that has become lodged in the ureter, or it may be due to the accumulation of multiple small fragments (a condition known as steinstrasse, or "stone street"). Urinary tract obstruction has been reported in up to 31 percent of patients undergone ESWL (1,2). The incidence of obstruction is related to stone size, location, and the number of calculi. The managment of steinstrasse varies only slightly from that of a solitary obstructing fragment. Symptomatic steinstrasse typically involves the distal ureter. An attempt to place a stent into the obstructed ureter is usually unsuccessful due to the tight packing of the fragments in the ureter. Percutaneous nephrostomy tube placement to the patient under local anesthesia will provide symptomatic relief. With proximal diversion, the steinstrasse often passes spontaneously. If obstruction persists, endoscopic intervention is indicated. Stone basketing is rarely successful. Proximal steinstrasse may respond to repeat ESWL, especially if there is a lead fragment as a source of obstruction. The judicious use of ureteral stent in the perioperative period will help to avoid obstruction by maintaining ureteral patency as the fragments pass alongside the stent.

Materials and Methods

We selected 81 patients from our ESWL treatment population (1576 renal unit) with steinstrasse. All patients were treated with the Dornier MPL 9000 lithotripter between April 1991 and April 1995. ESWL was performed with narcotic analgesics in all patients. X-rays were obtained in the first day after the treatment in all patients and then as frequent as necessary, determined by the clinical status. Of the patients with stone burden of greater than 100m. (2) 100 per cent were followed for at least 3 months after treatment at our institution.

Results

We identified 81 patients as having the complication of large steinstrasse. Fifty-six (69%) cases resolved spontaneously. We have reviewed 25 patients data. In all patients, steinstrasse was located in the distal ureter, the point of inertia being the ureterovesical junction with col-

lection of stone fragments ranging from 4 to 11 cm. in length. Radiographic measurement of the fragments within each large steinstrasse was performed and in all but 9 patients the fragment size was 2 mm. or less. The exceptions were 5 patients with 5mm. or less leading fragments and 4 with a 6 mm. or more leading fragment. Interval to diagnosis ranged from 12 hours to as long as 15 days after treatment, with the median internal being 3 days after ESWL.

Presenting signs and symptoms included classical renal colic in 14 patients with (8) or without nausea and vomiting. Leukocytosis was a common finding (6 patients), with serum a creatinine elevation occurring in 4 and temperature elavation in 3. Of interest, there were 8 asymptomatic patients.

Treatment programs were not predetermined but dependent upon the acuteness of presentation. A total of 14 patients were managed by electrohydraulic or ultrasonic ureteroscopic ureterolithotripsy. Six patients underwent elective ESWL for leading fragment. A total of 5 patients were managed by open ureterolithotomy.

Discussion

Steinstrasse is not very common, occurring in less than 5 per cent of cases in most series. Urinary tract obstruction has been reported in up to 31 percent of patients undergoing ESWL (1,3-5). This condition, which means "stone street", exists when a series of fragments line up in the ureter like a logjam. Usually, a larger "lead" fragment is responsible for the logjam. Many of these pass spontaneously. In our series, 69.1 percent passed spontaneously. They must be watched carefully. Fedullo et al.[4] reported that 75 percent of steinstrasse cases occurred in the distal ureter; 18 percent, in the proximal ureter; and 6 percent, in the midureter. They also reported that 75 percent of interventions were endoscopic, and 35 percent required intervention. In our series, we used endoscopic intervention in 14 cases (56%).

Indications for steinstrasse intervention are basically the same as those used for calculous obstruction of a solitary kidney with rising creatinine levels, urosepsis, and failure to pass fragments within a reasonable time (6). Steinstrasse should be treated if it is symptomatic (pain, sepsis) or causing a silent obstruction over a 30 day period (7). The alternatives include placement of a drainage percutaneous tube to allow fragments to pass, ureteroscopy, ESWL of a lead fragment, or open ureterolithotomy.

If the kidney is significantly obstructed, only short observation is prudent. If intervention is required, ureteroscopic treatment is often helpful with ureteral meatotomy; ureteroscopic lithotripsy with laser, ultrasound, or electrohydraulic probes; followed by stenting. Another quite acceptable strategy is to place a percutaneous nephrostomy and ureteroscopic management of large steinstrasse (greater than one third of ureteral length) (8). Upper ureteral seinstrasse can occasionally be cleared by repeat ESWL to the area of the "lead" fragment. Many urologists treating stones grater than 2 cm in size in the kidney place double-J stents prior to ESWL and leave them in place until the majority of fragments pass. This prevents obstruction and sepsis and facilitates passage of fragments (9). However, we have seen obstructing steinstrasse in patients in whom a double-J catheter was used.

Treatment of a steinstrasse is dependent of the presenting sings and symptoms, and general clinical status, taking into account patient age, cardiovascular reserve, infection, sepsis and renal function changes. In favorable situations observation alone may be elected, since 56 of our 81 patients (69.1%) passed the steinstrasse without further intervention.

Acute patients should be treated with upper tract urinary decompression, preferably percutaneous nephrostomy. We did not perform a percutaneous nephrostomy. Ureteroscopic electrohydraulic lithotripsy was 100 per cent successful in the 14 patients who required farther therapy with no complications, such as perforation or sepsis. Steinstrasse can be a particularly challenging technical ureteroscopic problem. A wire can not be passed because the ureter is packed full. Therefore, the usual over the wire dilating balloon can not be used to open the usually smaller than normal ureteral orifice. After the distal steinstrasse has been treated, the proximal portion of steinstrasse often migrates cephaled in the dilated ureter. Once the obstruction is relieved, the larger particles are removed and the orifice or point of impaction is sufficiently dilated to allow fragment passage around a stent which is placed for a several days to allow the edema to subside. After stent removal, the rest of the fragments will pass through the dilated distal ureter.

Another approach for the treatment of steinstrasse, in which a percutaneous approach already has been established would be the passage of a guide wire in an antegrade fashion and using an irrigating catheter with multiple side holes. Sterile fluid could be injected through the irrigating catheter, with the resultant hydraulic pressure dislodging the fragment (10).

In conclusion, although steinstrasse is an infrequent

complication of ESWL (5.1%), it can be insidious in presentation, and yet have considerable patient impact in terms of renal function and infection. Prevention is important and recognition that percutaneous nephrostomy, debulking procedures and Double-J stent do not always prevent steinstrasse. Cautionary approaches include maximum debulking before ESWL, attention to the amount of stone burden treated at a single ESWL session and careful timing in cases with significant bilateral disease.

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