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Ureteral Reflux and Ileal Conduit Pressure Following Diversion with a Reflux-preventing Technique

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ABSTRACT

Ileal conduit urinary diversion was performed with an antireflux technique, with nippling of the ureters into the segment, in 63 patients. The patients were then followed up for 52 ± 25 months concerning urographic findings, infections and kidney function. Ureteroileal stenosis developed in 3 of 122 ureters and was surgically corrected. Roentgenologic examination for ureteral reflux was performed about a year postoperatively, and pressure measurements were made in the ileal segment. Reflux of contrast medium was seen in 48 ureters at pressure 51 ± 30 mm Hg. When no reflux was seen, the maximum infusion pressure was 62 ± 34 mm Hg. The basal pressure (preceding contrast infusion) was 24 ± 29 mm Hg. Regular contraction waves with pressure rise in the ileal segment were registered, with duration 10-30 seconds. The study showed no connection between ureteral reflux and pressure in the ileal segment. Complications associated with the antireflux operating technique were few.

INTRODUCTION

In long-term follow-up after ileal conduit urinary diversion, high incidence of complications has been found, including chronic pyelonephritis, stone formation and deterioration of kidney function (5,8,10). These complications have been thought to have some connection with ureteral reflux (4).

Various reflux-preventing procedures have been used at operation (1). High incidence of ureteroileal stenosis has been attributed to reflux-preventing techniques for ureteroileal anastomosis (2). A survey of six series with antireflux anastomosis showed stenosis incidence ranging from 3 to 11 % (9). The nippled ureteroileal anastomosing technique described by Patil et al. (9) has been used as antireflux procedure at our clinic.

Ureteral reflux was earlier studied together with recording of conduit pressure, using simultaneous loopography (2). The aim of the present study was

to register the ileal conduit pressure continuously during contrast infusion, for documentation of reflux to the ureters, and to compare the findings with the clinical features.

MATERIAL AND METHODS

Patients

Sixty-three patients (45 male, 18 female, mean age 56.9 ± 12.6 years) with ileal conduit were observed for 52 ±25 months postoperatively. The indication for urinary deviation was malignancy in 51 cases and benign, predominantly neurogenic disease in 12 cases. Preoperative radiotherapy was given to 42 of the 51 patients with malignant disease. Three patients underwent salvage cystectomy after irradiation (60 Gy). Postoperative irradiation was given in one case.

Methods

Operation. The antireflux technique with nippling of the ureters into the ileal conduit (9) was used in all cases. The technique is illustrated in Fig.1.

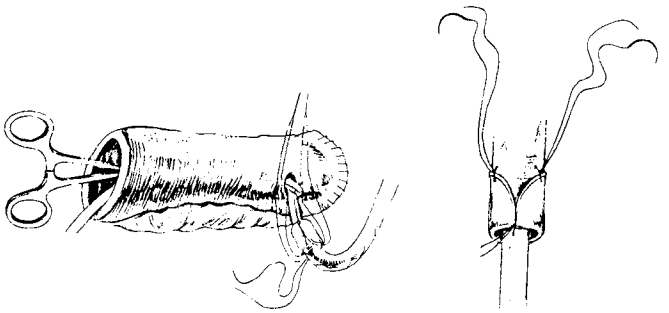

Fig. 1. The nippling ureteroileal anastomosis for prevention of reflux

Intravenous urography. This examination was performed preoperatively and 3,6 and 12 months postoperatively, and then every 12th month.

Infection control. Clinical analysis and culture of urine from the ileal segment , collected with a single-lumen catheter, were performed routinely 3, 6 and 12 months after diversion and then at least once yearly.

Kidney function. Studies were made at the above-mentioned intervals by measuring serum creatinine and Cr-EDTA clearance.

Pressure studies. Retrograde contrast infusion of the iliac bladder was performed about one year postoperatively, using a modified Foley catheter no 12 (Fig. 2), functioning as a double-lumen catheter.

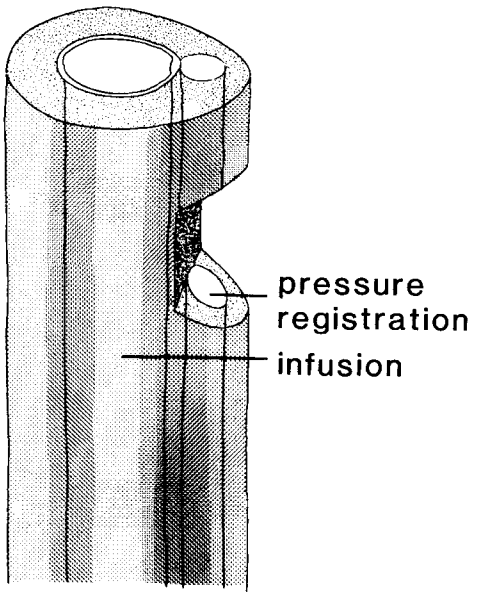

Fig. 2. Foley catheter with the balloon cut and a side hole made in the canal for pressure registration

Under fluoroscopic control the catheter tip was guided as close to the ureteral orifices as possible. Through one of the channels the intraluminal pressure was continuously registered (transducer Statham P 23 AC) with a linear writer (Mingograph 800, Elema-Schönander, Stockholm, Sweden). Before infusion of contrast medium the basal luminal pressure was registered for 2 minutes. Thereafter the contrast medium (Isopaque 30 %, Nyegaard, Norway) was administered as a drip infusion from a bottle positioned 100 cm above the stoma. The infusion velocity was 10 ml/min for 3 minutes, 20 ml/min for 5 minutes and free flow of contrast until 250 ml had been infused, with free outflow from the stoma. The films were exposed over the iliac segment, ureters and kidneys at 3 and 8 minutes and after the infusion. If a pressure rise was recorded in the segment, a supplementary film was exposed. Ileal conduit pressure was defined as the highest pressure during 30 seconds preceding the exposure.

Urography. Most ureters and renal pelves showed reversible dilation at the urography 3 months postoperatively, but in only 3 of 122 ureters was there persistent distal obstruction. Reanastomosis corrected the stenosis in these three ureters.

Stones. Renal calcifications were observed in four patients preoperatively and developed in nine postoperatively. None of these patients had signs of ureteral obstruction. Four showed ureteral reflux. Five patients were operated on for urinary calculi during the observation period.

Reflux studies. Reflux was found in 39 % of the ureters. Hence there appeared to be no reflux in 61 %.

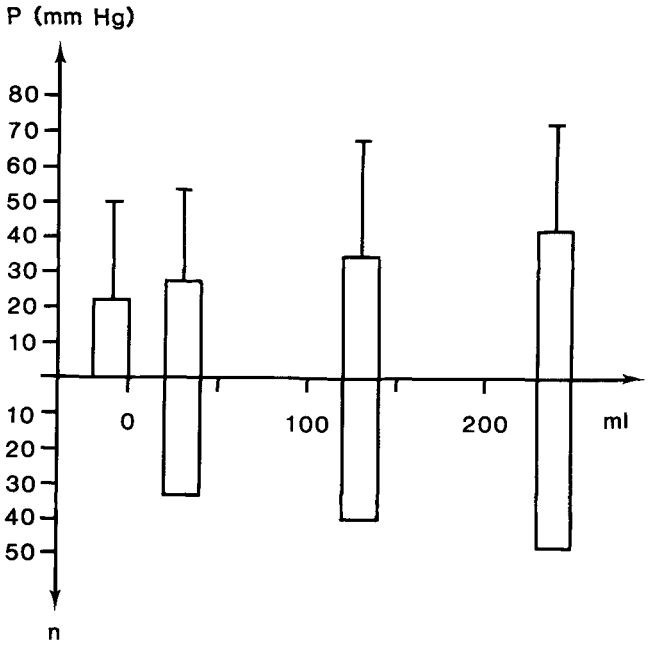

Fig. 3. Maximum intraluminal pressure (± 1 SD) in mm Hg (ordinate) at rest and in relation to the total contrast volume in ml (abscissa) in 63 ileal conduits (upper panel). The related numbers of ureters with reflux (n) are shown in the lower panel.

Intraluminal pressure. All the patients showed a lowest basal pressure < 10 mm Hg, with intermittent pressure peaks of 10-30 seconds' duration. The ileal conduit showed contraction during pressure peaks and was relaxed at basal pressure. In three patients with stenosis of the cutaneous stoma, the pressure did

not return to basal level between the contractions. The maximum pressure registered before the start of the infusion was 24 ± 29 (0-110) mm Hg. During infusion the corresponding figures were 62 ± 34 (15-150) mm Hg for patients without reflux and 51 ± 30 (30-110) mm Hg for those with reflux (difference not statistically significant). The maximum pressure at the occurrence of reflux was 28 ± 25 (0-100) mm Hg (Fig. 3). A typical pressure recording is shown in Fig. 4.

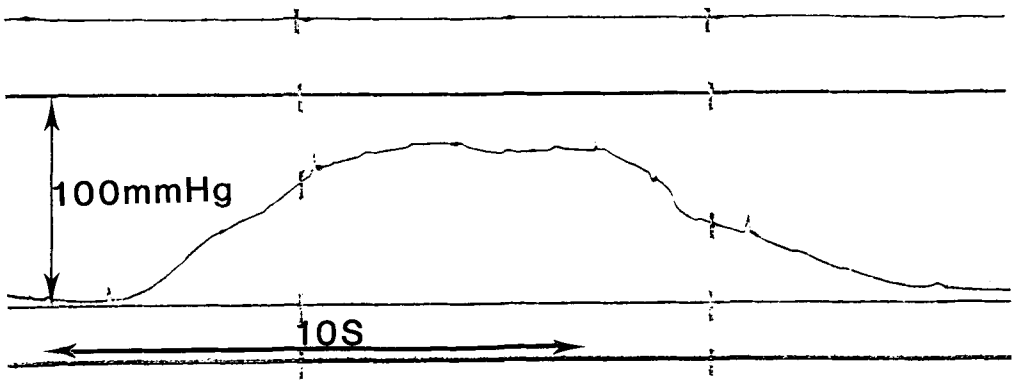

Fig. 4. Pressure recording from an ileal conduit: Film exposures are indicated by vertical bars

Infections. In six (12.5 %) of the kidneys with reflux and in three (4 %) of those without reflux there was clinically manifest pyelonephritis with fever and flank pain. Impairment of renal function, measured as elevation of serum creatinine, occurred in two of these patients. Function was lost in one kidney, due to ureteral stenosis, and nephrectomy was performed. Another of the nine patients had urographic signs of pyelonephritis. All 63 patients had positive urine culture on at least one occasion postoperatively, but only the nine above-mentioned had clinical pyelonephritis.

Renal function. At the end of the follow-up period, 11 patients showed

deterioration of renal function. Six of these patients had had normal serum creatinine levels preoperatively. Two of the six had unilateral reflux and four had no reflux. Three of the same six patients had had clinical pyelonephritis in the postoperative period.

DISCUSSION

Compared with results after other techniques of operation, the complication rate in this case series was relatively low (5,8), although the follow-up time is short. Our investigations showed no reflux to the kidney in 61 % of the patients, but in 39 % the technique did not prevent reflux.

The recordings in the ileal conduit showed that relatively high pressures were present locally at the site of ureteral implantation. These high pressures may be related to nonpulsatile contractions in the ileal conduit (3). Reflux could possibly entail conduction of the elevated pressures to the renal pelvis, causing intermittently high pressure to the renal parenchyma. Theoretically the ureteral peristalsis might counteract this pressure rise, but dilation of the ureter makes this peristalsis ineffective. Further, ureteral peristalsis has been shown to lack any coordination with the contractions of the conduit (3).

Infections from the ileal conduit may be transferred to the renal pelvis in the same way. All of our patients had at least one positive urinary culture from the ileal conduit during the observation time. Only nine, however, had clinically manifest signs of upper urinary tract infection. A possible explanation is that the anatomy of the renal pelvis is important for the development of pyelonephritis (6,7).

The potential dangers of low-pressure contra high-pressure reflux are sometimes debated. Since intermittently high pressures were registered in the conduit in almost all of our patients, this distinction cannot be made (2). Although the incidence of pyelonephritis was slightly higher in the refluxing than in the nonrefluxing ureters, the series was too small to permit conclusions in this respect. We found no difference in stone formation related to reflux. As, in comparison with other surgical techniques, no negative effects were found with the antireflux procedure, we are continuing to use this type of operation.

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