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## CLINICAL EXPERIENCE OF THE KOCK CONTINENT ILEAL URINARY RESERVOIR IN 20 CASES FOCUSING ON COMPLICATIONS

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From August 1986 through July 1990, 20 patients underwent construction of the Kock continent ileal reservoir and were observed for more than three months. The early complications within the first 3 months were wound infection in four patients (20%), leakage at uretero-intestinal anastomosis in three patients (15%), prolapse of efferent limb and ileus in two patients (10%) and reflux, ureteral stenosis, intestinal fistula and postoperative pancreatitis in one patient (5%). The three late complications included stone formation in two patients and stenosis at an afferent limb in one patient. The stenosis occurred at the position of Dacron collar. The patients were divided into two groups and we compared the recent 10 patients with the initial 10 patients on complications and end results. In the initial group, 8 patients (80%) had 14 complications. In the recent group, 4 patients had 4 complications. The early complications have been reduced with the increase of Kock pouch operation. The result of the recent group was better than that of the initial group. Frequency of postoperative hydronephrosis in patients with Kock pouch was investigated. In nine patients (45%) the minimal hydronephrosis occurred within the first two months and in 5 patients (25%) three months after the operation. It had a normalizing tendency. The maximum pouch pressure at the pouch volume of 400 to 500 ml was not significantly high ( $37.9 \pm 12.2$  cmH<sub>2</sub>O, mean  $\pm$  S.D.).

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**Key words:** Kock pouch, Complication, Urinary diversion

### INTRODUCTION

Continent ileal urinary reservoirs, including the Kock pouch, has contributed to improve the quality of life of patients in need of urinary diversion. However, significantly high rates of late complications through nipple valves have been reported. In the past four years, we have performed Kock pouch operations and long follow-up in 20 patients, the results of which are presented here.

### MATERIAL AND METHODS

From August, 1986 through July, 1990, 20 patients underwent construction of the Kock continent ileal reservoir (Kock pouch) and were observed for more than three months in our department. There were 18 men and 2 women, and their ages ranged from 43 to 74 years (59.9 years on aver-

age). The underlying diseases were carcinoma of the bladder in 18 patients, prostate cancer in one and combined carcinoma of the bladder and ureter in one. All patients underwent simultaneous radical cystectomy and left nephroureterectomy was added in one patient. The follow-up period ranged from 4 to 50 months (21 months in average).

**Surgical technique.** We have used the original technique described by Kock<sup>1)</sup> modified by Okada<sup>2)</sup> and Arai<sup>3)</sup>. Mesenteric fat was removed with a CUSA (Cavitron Ultrasonic Surgical Aspirator) for 8 cm along the afferent-efferent limbs of the pouch. To prevent eversion and prolapse, the nipple valve was fixed to the pouch wall by making a 3 cm longitudinal incision through the outer layer of the nipple valve and the opposite pouch wall and sewing the edges of nipple valve incision

to the edges of pouch wall incision. Three layers of staples were applied to the intussuscepted nipples of the afferent limbs with a SGIA 50 PREMIUM Surgical Stapler. Two layers of staples were applied to the nipples of the efferent limbs and another was used to fix the efferent limbs to the back wall of the pouch itself. A strip of sauvage filamentous Dacron serves as a collar at the base of the nipples to fix the afferent-efferent limbs to the pouch. Polyglycolic acid felt was used instead of sauvage filamentous Dacron as a collar at the base of the afferent limb in the last five cases.

### RESULTS

The operating time for creating of a Kock pouch was 4.5 to 8.5 hours (5.87 hours in average) (Table 1). There were no operative mortalities or intraoperative complications.

Self catheterization is performed every 4 to 6 hours during the day and the capacity of the pouch was 270 to 700 ml (460 ml in average). The capacity of the pouch represented the maximum volume during the follow-up time.

The results were classified into four groups: excellent, good, fair and poor: nine patients had excellent results with no complications at all; eight patients had

good results with solved complications; one patient had fair results with unsolved complications; two patients showed poor results with complete incontinence.

The early complications within the first 3 months were wound infection in four patients (20%), leakage at uretero-intestinal anastomosis in three patients (15%), prolapse of efferent limb and ileus in two patients (10%) and reflux, ureteral stenosis, intestinal fistula and postoperative pancreatitis in one patient (5%) (Table 2). Staphylococcus aureus was detected in the pus of two patients with wound infection. Resuture of wound with the debridement was needed in one patient. Three leakages at uretero-intestinal anastomosis were treated conservatively though bilateral nephrostomy was needed in one case. Though reoperation was performed in one patient with prolapse, prolapse recurred. Now two patients with prolapse were treated with the balloon catheter indwelling.

The three late complications included stone formation in two patients and stenosis at an afferent limb in one patient (Table 2). Endoscopic removal of the stones was easily carried out. The staples were found in the stones (Fig. 1). One patient had a recurrence of stone formation. Stone analysis revealed that the stone consisted of magnesium ammonium

Table 1. Clinical features of 20 cases with Kock pouch.

Case	Age	Sex	Diagnosis	Operating time for Kock pouch	Capacity (ml)	Result	Follow-up time (months)
1	53	M	B.T.( TCC,G3,pT2N0M0)	5:04	300	poor	50
2	63	M	B.T.( TCC,G3,pT1bN0M0)	5:50	700	good	47
3	64	M	B.T.( TCC,G2,pT1bN0M0)	6:00	500	good	46
4	54	F	B.T.( TCC,G2,pT1aN0M0)	5:50	550	poor	45
5	61	M	B.T.( TCC,G3,pT3aN0M0)	5:00	600	good	32
6	63	M	B.T.( TCC,G2,pT4N0M0)	6:35	400	fair	30
7	56	M	B.T.( TCC,G3,pT0N0M0)	5:50	350	good	25
8	49	M	B.T.( TCC,G3,pT1bN0M0)	6:20	560	excellent	23
9	66	M	P.C.( Adeno Ca. StageC)	5:00	570	excellent	23
10	55	M	B.T.( TCC,G3,pT3bN2M0)	6:15	500	good	15
11	43	M	B.T.( TCC,G2,pT2N0M0)	6:13	500	excellent	15
12	62	M	B.T.( TCC,G3,pT4N1M0)	5:40	500	excellent	15
13	74	F	B.T.( TCC,G3,pT1bN0M0)	6:00	400	good	14
14	59	M	B.T.( TCC,G2,pT1bN0M0) U.T.	6:00	400	excellent	11
15	69	M	B.T.( TCC,G3,pT1bN0M0)	6:00	400	excellent	7
16	60	M	B.T.( TCC,G3,pT3bN0M0)	5:15	400	good	6
17	60	M	B.T.( TCC,G3,pT3bN0M0)	5:25	500	excellent	5
18	64	M	B.T.( TCC,G3,pT1aN0M0)	8:30	400	excellent	5
19	64	M	B.T.( TCC,G3,pT3bN0M0)	4:30	400	excellent	5
20	59	M	B.T.( TCC,G2,pT1aN0M0)	6:00	270	good	4

B.T.: bladder tumor, P.C.: prostatic cancer, U.T.: ureter tumor

Table 2. Summary of complications.

Complications	No. of cases (%)
<b>Early</b>	
Wound infection	4(20)
Leakage at uretero-intestinal anastomosis	3(15)
Prolapse of efferent limb	2(10)
Ileus	2(10)
Reflux	1(5)
Ureteral stenosis	1(5)
Intestinal fistula	1(5)
Postoperative pancreatitis	1(5)
<b>Late</b>	
Stone formation	2(10)
Stenosis at afferent limb	1(5)

phosphate. In the patient with stenosis at an afferent limb, acute renal failure was first noticed. Surgical repair was performed after the bilateral nephrostomy. CT revealed two cavities; the left one was the pouch itself and the right one was the dilate afferent limb (Fig. 2). Nipple obstruction seemed to have occurred at the position of Dacron collar. Dacron erosion was found intraoperatively. Dacron fabric was dissected out from inside of the pouch.

None of the patients undergoing Kock pouch had hyperchloremic acidosis or electrolyte abnormalities. Diarrhea or malabsorption after the construction of the Kock pouch incorporating approximately 70 cm of distal small bowel was not seen. The excretion volume of urinary oxalate was normal ( $27.2 \pm 8.5$  mg/day mean  $\pm$  S.D.).

The patients were divided into two groups and we compared the recent 10 patients with the initial 10 patients on complication and end result (Table 3). While in the initial group 8 patients (80%) showed 14 complications, in the recent group 4 patients had 4 complications (40%). Seven patients (70%) in the initial group and 10 patients (100%) in the recent group had excellent and good results. The result of the recent group was better than that of the initial group.

Frequency of postoperative hydronephrosis in patients with Kock pouch was investigated (Table 4). Nine patients (45%) with minimal hydronephrosis were seen within the first two months and 5 patients (25%) three months after the operation. It showed a normalizing tendency. Two cases of moderate hydronephrosis were seen; one was unilateral hydronephrosis

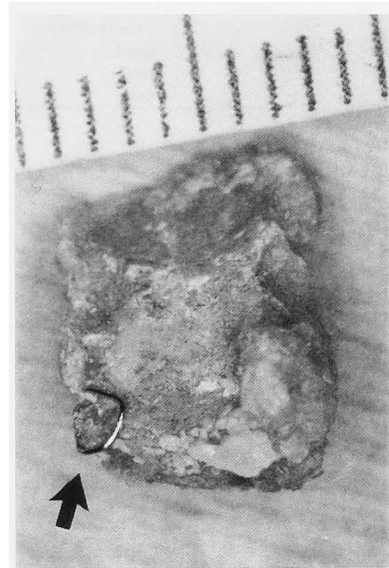


Fig. 1. Stone formation. The staple was found in the stone (arrow).

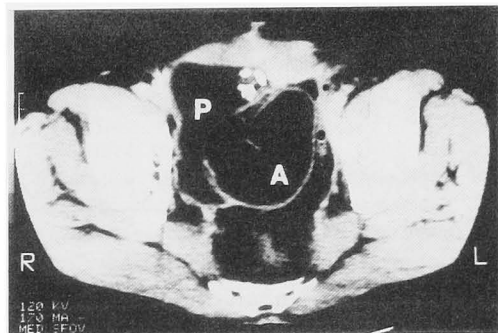


Fig. 2. Stenosis at afferent limb. CT revealed two cavities; P: pouch, A: the dilated afferent limb.

caused by metastasis and the other was bilateral hydronephrosis caused by stenosis at an afferent limb.

Table 3. Comparison between the recent 10 patients and the initial 10 patients in terms of complications and end results.

		Initial 10Pts.	Recent 10Pts.
<b>Complications</b>			
	Overall incidence of complications	14 (80%)	4 (40%)
	Wound Infection	3	1
	Leakage at uretero-intestinal anastomosis	3	0
	Prolapse of valve	2	0
	Ileus	1	1
	Reflux	1	0
	Ureteral stenosis	0	1
	Intestinal fistula	0	1
	postoperative pancreatitis	1	0
	Stone formation	2	0
	Stenosis at afferent limb	1	0
<b>Result</b>			
	excellent	2 (20%)	7 (70%)
	good	5 (50%)	3 (30%)
	fair	1 (10%)	0
	poor	2 (20%)	0

Pouchmetry was performed over five months postoperatively. The maximum pouch pressure at the pouch volume of 400 to 500 ml was not significantly high ( $37.9 \pm 12.2$  cm H<sub>2</sub>O, mean  $\pm$  S.D.). Thus the Kock pouch was regarded as the low pressure reservoir.

### DISCUSSION

High rates of late postoperative complications with nipple valves, especially in the

Table 4. Frequency of hydronephrosis in patients with Kock pouch.

Severity	Pre-operation	Post-operation	
		1-2 months	>3 months
Normal	20 (100%)	10 (50%)	13 (65%)
Minimal		9 (45%)	5 (25%)
Moderate		1 (5%) *	1 (5%) *
Severe			1 (5%) **

\*unilateral hydronephrosis caused by metastasis

\*\*bilateral hydronephrosis caused by stenosis at afferent limb

Table 5. Complication rate in Kock pouch operation.

	Kock	Waters	Kitajima	Okada	Skinner			Arima	
	1985	1987	1987	1988	First	Next	Last	1989	1990
No. of patient	31	15	17	75	150	100	289		20
Nipple malfunction (including difficult catheterization)	15(48%)	3(20%)	11(65%)	9(12.5%)	40 (26%)	22 (22%)	39 (14%)		2(10%)
Afferent limb problems		1 (7%)	3 (18%)	2(2.8%)	11 (7%)	2 (2%)	2 (1%)		2(10%)
Stone formation	0	0	0	6(8.5%)	23 (15%)	6 (6%)	4 (1.7%)		2(10%)

afferent limb, have been reported (Table 5)<sup>2,4-7)</sup>. Several modifications to reduce the malfunction of the nipple have been made to reduce the late complication of incontinence and the difficulty in catheterization. To prevent the prolapse of the nipple, we have used CUSA to remove mesenteric fat while avoiding devascularization of both limbs. And we fixed the nipple valve to the pouch wall by making a

3 cm longitudinal incision through the outer layer of the nipple valve and the opposite pouch wall and sewing the edges of nipple valve incision to the edges of pouch wall incision in addition to the use of SGIA 50 PREMIUM Surgical Stapler. Recently we had no prolapse of the nipple valve though we experienced two cases of prolapse of the nipple valve in early patients.

The early complications have been reduced with the increase of Kock pouch operation. The result of our recent 10 patients group was better than that of our initial 10 patients group. Hereafter problems of stone formation caused by staples and bacteriuria in the pouch or erosion caused by the Dacron collar remained. Calculi may be formed only if nonabsorbable material such as the metal staples remain exposed above the mucosa. Care must be taken to bury staples at the time of surgery. Absorbable staples are useful for this purpose. The successful stabilization of the intussuscepted nipple valve in creation of the ileal and colonic continent urinary reservoir without using staples to act as a nidus for stone formation has been reported<sup>8)</sup>. Technique for stabilization of the nipple valve included complete mesenteric exclusion from the nipple valve, use of a Dacron mesh collar at the base of intussusception, and fixation of the nipple valve to the pouch wall by making a 2~3 cm longitudinal full-layer incision through the outer layer of the nipple valve and the opposite pouch wall and sewing the edges of nipple valve incision to the edges of the pouch wall incision.

The late complications of the afferent nipple valve were observed in 11 of the 42 (26%) patients by Arai et al<sup>9,10)</sup>. These included erosion of Dacron fabric used as a collar (5 patients), afferent nipple stenosis (3 patients) and afferent nipple obstruction by mucous plug or fungus ball (3 patients). We had one case of nipple obstruction at the position of Dacron collar. Intraoperative findings showed Dacron erosion. The presence of any other nonabsorbable material should be minimized. Therefore we have stopped using the Dacron collar in the late five cases. We have used absorbable polyglycolic acid felt instead of sauvage filamentous Dacron as a collar at the base of afferent limb in the last five cases.

All of the current alternative forms of urinary diversion have both advantages and disadvantages. Some of the advantages include less patient resistance to a radical pelvic operation, no need for an

external collecting device, clean intermittent catheterization every 4 to 6 hours and an improved body image with an improved quality of life.

The long-term effects on the kidney and the gastrointestinal tract remain to be evaluated. We recommend careful follow-up of late complications such as stone formation and stenosis at an afferent limb. Although our experience is rather small, we are encouraged by the results and believe that this procedure is a sound concept that offers an alternative form of urinary diversion for the properly selected patient.

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## 和文抄録

Kock continent ileal urinary reservoir による  
尿路変更術20例の検討：特に合併症について

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われわれは1986年8月より1990年7月までに、20例の Kock continent ileal reservoir による尿路変更術を施行した。術後3カ月以内の早期合併症として、創部感染4例（20%）、尿管回腸吻合部からの尿漏出3例（15%）、輸出脚の脱出、腸閉塞は各2例（10%）逆流、尿管狭窄、回腸吻合不全、術後膀胱炎は各1例（5%）ずつ認めた。晚期合併症として pouch 内結石形成2例（10%）、輸入脚狭窄1例（5%）をみたが、この狭窄は Dacron collar の部位に認めた。早期10例と後期10例に分け、各グループの合併症と手術成績を比較検討した。早期10例のうち8例（80%）にの

べ14例の合併症を認めたが、後期10例では4例（40%）に減少した。症例が増すにしたがって早期合併症は減少し、手術成績も後期10例の方が早期10例より良好であった。術後水腎症の検討を行ったところ、術後1、2カ月目では9例（45%）に軽度の水腎症が認められたが、術後3カ月以降は5例（25%）と、正常化する傾向が認められた。pouch 内に400~500 ml 注入時の最大 pouch 内圧は  $37.9 \pm 12.2$  cmH<sub>2</sub>O (mean  $\pm$  SD) と、注入に伴う内圧の著明な上昇は認めなかった。

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