RESEARCH COMMUNICATION

Hydronephrosis after Radical Hysterectomy: A Prospective Study

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Abstract

One part of the operative procedure of radical hysterectomy (RH) is the dissection of the ureter from its overlying tissue and this may result in injury to the ureteric adventitia. This might induce ureteric obstruction and consequently produce hydronephrosis. The objective of this prospective study was to evaluate the incidence of hydronephrosis after RH in patients with early stage cervical cancer. From July 2006 through March 2007, 77 patients with IA2-IIA cervical cancer who planned to undergo radical hysterectomy and pelvic lymphadenectomy (RHPL) received urinary tract ultrasonography 5 times (one day before surgery and 7 days, 6 weeks, 3 months and 6 months after the operation) from one radiologist. Patients who had hydronephrosis before surgery, suffered intraoperative ureteric injury, or were lost follow-up at 7 days after surgery were excluded from the study. Urinary tract ultrasonography was performed on 77, 55, 52 and 52 patients at each visit. Right hydronephrosis was detected in 16, 7, 5 and 3 patients, and left hydronephrosis in 16, 11, 3 and 1 , at 7 days, 6 weeks, 3 months and 6 months, respectively, after the operation. Hydronephrosis persisted in 8 patients (15%) after 3 months. Two of these had undergone exploratory laparotomy for lysis of ureteral adhesions. One patient who developed hydronephrosis had local recurrence and received further treatment with concurrent chemoradiation therapy. In conclusion, the incidence of persistent hydronephrosis over 3 months after RHPL was 15%, even without intra-operative ureteric injury. However, only a few cases required surgical intervention.

Key Words: Cervical preneoplasia - LEEP - perioperative complications - risk factors - Thailand

Introduction

Radical hysterectomy and pelvic lymphadenectomy (RHPL) is the standard surgical procedure for stage IA2-IIA cervical cancer patients who are medically fit to tolerate an aggressive surgical approach and wish to avoid long term adverse affects of radiation therapy (Averette et al.,1996). The operative procedure consists of resecting the parametrial tissues to the pelvic wall, with complete dissection of the ureters from their beds and mobilization of the bladder and the rectum to allow more extensive tissue removal. The proximal vagina is resected at least 2 to 3 cm. Bilateral pelvic lymphadenectomy is usually carried out prior to radical hysterectomy. During dissection of the ureter from its overlying peritoneum and the vesicovaginal ligament, the ureteric adventitia may be injured and induce ureteric obstruction. Therefore, patients may develop hydronephrosis after this procedure.

The incidence of persistent hydronephrosis occurring after radical hysterectomy in cases with no obvious intraoperative injury to the ureter varied from 0-68% (Ulmsten, 1975; Larson et al. 1987; Tsurusaki et al., 1994; Kim et al., 2002; Paick et al., 2003). Such a wide range may result from differences in surgical techniques in each

center. To identify the magnitude of this problem, we conducted this prospective study to evaluate the incidence of hydronephrosis after radical hysterectomy in cervical cancer patients by using urinary tract ultrasonography.

Materials and Methods

After approval from the Research Ethics Committee, patients with stage IA2-IIA cervical cancer who were scheduled to undergo RHPL at Chiang Mai University Hospital between July 2006 and March 2007 were invited to enter the study.

Urinary tract ultrasonography was performed one day before the operation, then at 7 days, 6 weeks, 3 months, and 6 months after the operation by the same ultrasonologist (J.E.). Patients who revealed prior hydronephrosis and intra-operative ureteral injuries or loss at one-week follow-up were excluded from the study. The radical hysterectomy was carried out by gynecologic oncologists, support staff and fellows. The operation consisted of bilateral systematic pelvic lymphadenectomy followed by a Piver-Rutledge class III radical hysterectomy with nerve sparing procedure (Piver et al., 1974; Charoenkwan et al., 2006). Neither peritonization

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nor retroperitoneal drainage was performed.

A Foley's catheter was inserted on the day of surgery and left in place for one week. After that, the patients were instructed to perform self catheterization for urinary drainage if the residual urine on day 7 was more than 75 ml for 2 consecutive voids. The patients whose surgical pathology revealed high risk factors, i.e. positive lymph nodes, parametrial involvement and positive surgical margins or intermediate risk factors such as deep stromal invasion and lymphovascular space invasion (LVSI), were additionally treated with concurrent chemoradiation. The patients who only had more than 10 spaces LVSI were treated with cisplatin chemotherapy.

The degree of hydronephrosis was classified as grade I (mild dilatation of renal pelvis and urinary stasis), grade II (moderate dilatation and wide separation of renal pelvis without renal parenchyma thinning), or grade III (marked dilatation and calyceal clubbing with renal parenchyma thinning) (Mittelstaedt CA, 2004). In this study, persistent hydronephrosis was defined as hydronephrosis which was found over 3 months after the operation.

Results

During the study period, 89 patients with stage IA2-IIA cervical cancer planning to undergo RHPL were invited to enter the study. Twelve patients were excluded because of abandoned RHPL (4), intraoperative ureteral injury (2), change of operation (2), loss of one-week follow-up (2), and altered final diagnosis to high grade squamous cell intraepithelial neoplasia (1) and endometrial cancer (1). The remaining 77 patients were available for analysis. Their clinical characteristics are listed in Table 1.

The mean age of these patients was 44 years and the mean body mass index was 23.8 kg/m2. Twenty-nine (37.7%) patients had history of previous operation. Most of the previous surgery was tubal resection. Two patients had previous nephrolithotomy. Two-thirds of the patients were in stage IB1 cervical cancer. The mean length of resected parametrium was 2.8 centimeters and one third of the patients received concurrent chemoradiation after RHPL.

None of the patients had hydronephrosis before the operation. Most patients did not complete the 4 follow-up visits, as shown in Figure 1. Only 32 patients were completely followed up every visit, while 54 and 42 patients attended follow-up visits at 6 weeks and 3 months post-operation, respectively. Appearance of new hydronephrosis could occur at any visit postoperatively until 6 months. However, about 20% of the patients developed hydronephrosis in each side 1 week after operation and 50-70% of them revealed spontaneously regression at 6 weeks and 3 months after that. Only 1 left hydronephrosis and 3 right hydronephrosis were observed at 6 months post-operation.

Totals of 55, 52 and 52 patients underwent ultrasonographic examination at 6 weeks, 3 months and 6 months after the operation, respectively. Right hydronephrosis was noted in 16, 7, 5 and 3 patients while left hydronephrosis was noted in 16, 11, 3 and 1 patients

Table 1. Clinical Characteristics of the Patients (N = 77, Number and % data)

| Parameter		Finding
Mean age (range: year)		44 (26-72)
Mean body mass index (range: kg/m2)		23.8 (14.8-36.1)
Stage	- IA1	6 (7.8)
	- IA2	5 (6,5)
	- IB1	51 (66.2)
	- IB2	8 (10.4)
	- IIA	7 (9.1)
The mean length of parametrium (range)		
	- Left	2.9 (2.0-4.0 cm)
	- Right	2.9 (1.5-4.0 cm)
Adjuvant therapy	- Chemoradiation	24 (31.2)
	- Radiation	3 (3.9)
	- Chemotherapy	3 (3.9)
Intra-operative blood transfusion		15 (19.5)
Previous surgery		29 (37.7)
	- Tubal resection	19 (24.7)
	- Cesarean section	5 (6.5)
	- Nephrolithotomy	2 (2.6)
	- Ovarian cystectomy	2 (2.6)
	- Appendectomy	1 (1.2)
Menopausal status	- Premenopause	60 (77.9)
	- Postmenopause	17 (22.1)
Histology	- Squamous cell carcinoma	48 (62.3)
	- Adenocarcinoma	26 (33.8)
	- Others	3 (3.9)

at 1 week, 6 weeks, 3 months and 6 month after the operation, respectively. Only one patient developed grade 3 right hydronephrosis at 6 weeks and 3 months post-operation. Bilateral hydronephrosis was noted in 8, 5 and 1 at 1 week, 6 weeks and 3 months post-operation, respectively.

Persistent hydronephrosis was identified in 8 patients (15.4%). Two of these patients received adjuvant concurrent chemoradiation. Of these 8 patients, 5 had grade I, 1 had grade II and 2 had grade III hydronephrosis. These 8 patients were asymptomatic. Intravenous pyelography (IVP) was performed in 6 patients after consulting the urologist to identify the level of ureteric obstruction. The other 2 patients were lost to follow-up before receiving further investigation. Of the 6 patients with asymptomatic persistent hydronephrosis, 2 underwent lysis of ureteric adhesion, and 3 were closely followed at urology unit. The remaining 1 patient developed local recurrence and was treated with concurrent chemoradiation.

Discussion

This study shows that asymptomatic hydronephrosis may occur after RHPL for cervical cancer despite no obviously ureteral injury during the operation. Persistent hydronephrosis was noted in 8 (15%) patients at 3 months after the operation, and if we exclude 1 recurrent patient, the exact incidence of hydronephrosis developed from complications of surgery is 13%. However, only 2 had grade III hydronephrosis requiring surgical correction of ureteral obstruction.

Ureteral obstruction occurring without ureteral injury after radical hysterectomy may result from local edema
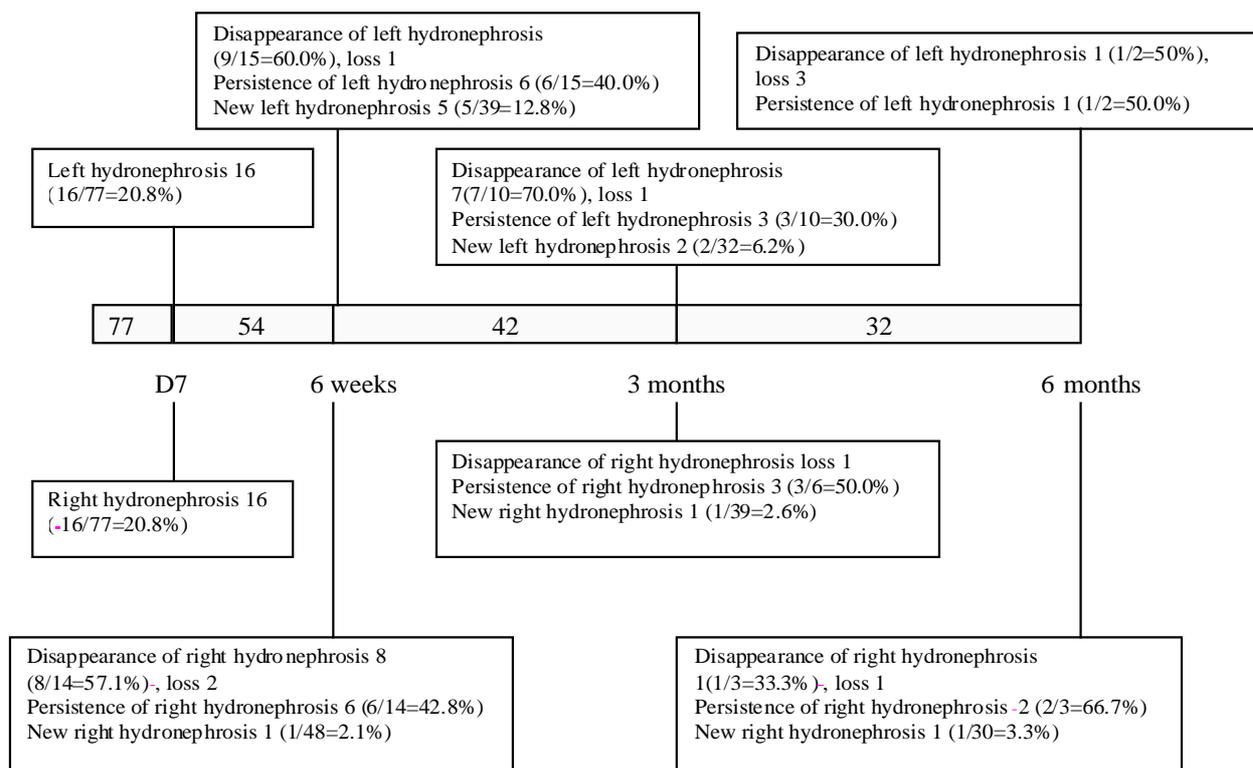
Figure 1. Details of Patients who Completed Scheduled Follow-up Visits (dotted box, numbers for each visit)

of the distal ureter, separation of ureter from the adventitia, lack of vascularization, and lymphocyst formation (Larson et al., 1987; Bosze et al., 1993). Surgical techniques that can decrease the risk of ureteral complications include meticulous hemostasis and gentle manipulation of the ureter during dissection from the vesicouterine ligament. Continuous bladder drainage after the operation is advised to prevent bladder distention and ureteral dilatation resulting from periureteral edema and inflammation (Larson et al., 1987).

The incidence of hydronephrosis after radical hysterectomy without intraoperative ureteral injury depends on surgical techniques, methods, and interval of urologic evaluation. Several authors have reported the occurrence of hydronephrosis after radical hysterectomy (Ulmsten, 1975; Larson et al.,1987; Kim et al., 2002; Paick et al., 2003). Paick et al. performed intravenous pyelography (IVP) at 2 weeks post-operatively in 34 patients undergoing radical hysterectomy for stage IA-IIB cervical cancer and noted that 7 (21%) developed hydronephrosis. At 4 weeks after surgery, the hydronephrosis disappeared in 3 patients and became worse in 2 patients. However, all hydronephrosis spontaneously resolved 6 months after the operation and no new hydronephrosis occurred 3 months after surgery. The higher stage of cervical cancer and older patient age were significantly correlated with developing hydronephrosis (Paick et al., 2003).

Ulmsten performed isotope renography and intravenous urography in stage IA-IIB cervical cancer patients before and after radical hysterectomy at 2 weeks, 2 months, 4-6 months, and then annually until 5 years. Among 100 consecutive patients, 40% of those treated with surgery alone developed severe hydronephrosis, compared with only 9% of patients treated with surgery

plus radiation. Approximately two-thirds of patients treated with surgery alone required additional surgical intervention to relieve the ureteric obstruction (Ulmsten, 1975).

Larson et al. used intravenous pyelography (IVP) to diagnose hydronephrosis in 299 patients undergoing radical hysterectomy for stage IB cervical cancer. Among these patients, 5% had severe ureteral dilatation but spontaneously resolved within a median of 94 days post-operatively (Larson et al.,1987). Kim et al. noted the 20% incidence of hydronephrosis at 2 weeks after radical hysterectomy in 34 patients; however, all hydronephrosis disappeared spontaneously at 6 months after the operation (Kim et al.,2002).

In the present study, the incidence of hydronephrosis in the left or right kidney was 20% one week after surgery. The incidence decreased with time after surgery. At 6 weeks and 3 months post-operation, the hydronephrosis spontaneously disappeared more than 50% of cases. However, new hydronephrosis was noted in 13%, 6% and 3% of patients at 6 weeks, 3 months and 6 months post-operation, respectively. The incidence was higher in the left kidney than the right kidney.

In contrast, Tsurusaki et al. reported that 68% of 50 patients undergoing radical hysterectomy developed hydronephrosis, and that it was more frequent and more severe in the right kidney. Approximately 60% of the hydronephrosis disappeared spontaneously one year after surgery (Tsurusaki et al.,1994). The differences in incidence and severity of postoperative hydronephrosis might result from different cancer stages and surgical techniques.

In our study, 2 of 8 patients with persistent hydronephrosis over 3 months received surgical adhesiolysis by a urologist to relieve ureteral obstruction.

The surgical correction rate was higher than in previous reports, which showed no surgical intervention for such patients (Larson et al., 1987; Kim et al.,2002; Paick et al.,2003).

Differences in surgical correction depended on the decision of urologists in each institute, since the patients had normal renal function and no urinary symptom. Two of our patients with similar severity of hydronephrosis received different treatments. One underwent surgical correction by urologist in a provincial hospital while the other one was closely observed by urologists in our university hospital.

Tsurusaki et al. (1994) reported that no significant therapeutic benefit was noted among the 3 methods, i.e. insertion of ureteral stent, percutaneous nephrostomy, and close observation. Long term observation for 1 year was advised before surgical intervention. Post-operative radiation had no significant influence on the development of hydronephrosis (Tsurusaki et al., 1994). In our study, 2 of 8 patients with persistent hydronephrosis received prior concurrent chemoradiation. However, others noted that postoperative radiation may affect the occurrence of hydronephrosis by inducing periureteral inflammation and fibrosis. (Piver et al., 1974)

In the current study, we used urinary tract ultrasonography instead of intravenous pyelography to detect hydronephrosis. Both methods have similar accuracy in detecting hydronephrosis. Renal ultrasonography has been recommended by some investigators as the method of choice for screening ureteral obstruction (Vanderpuye V, 2002, Frohlich et al.,1991). Urinary tract ultrasonography is more convenient and more cost-effective than intravenous pyelography because no contrast media is required.

The limitation of the present study was the small number of patients who completed follow-up examinations with urinary tract ultrasonography. Only 34 patients of 77 patients (44%) attended scheduled follow-up visits. This limitation certainly obscured the actual incidence and the spontaneous regression rate of postoperative hydronephrosis.

In conclusion, asymptomatic hydronephrosis could occur after radical hysterectomy for cervical cancer despite no obvious intraoperative ureteral injury. Persistent hydronephrosis is noted in 15% of the patients. However, very few patients need surgical intervention to relieve the obstruction. Gentle dissection of the ureter, meticulous hemostasis, and continuous bladder irrigation are advised to decrease the risk of this complication after radical hysterectomy. The surgeon should be aware that this complication may occur even through there is no intraoperative ureteral injury.

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