

Post-Hysterectomy Transient Hydronephrosis: A Prospective Study

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Abstract

Objective: To determine the incidence and importance of transient asymptomatic hydronephrosis following total hysterectomy.

Materials and methods: In a prospective study over 4 year, 368 women were studied who had undergone a total abdominal or vaginal hysterectomy. Totally, 95% of operations were done for benign diseases (abnormal uterine bleeding, chronic pelvic pain, uterine prolapse, etc.) and 5% were performed for uterine malignancy. Renal ultrasonography was performed before and 3, 7 and 28 days after the surgery for diagnosing hydronephrosis. Intravenous urography was performed in patients with either persistent/progressive or symptomatic hydronephrosis.

Results: There was no intraoperative identifiable ureteral injury. Hydronephrosis was seen in 35 (9.5%), 21 (5.7%), and 1 (0.27%) patients at days 3, 7 and 28 after the operation, respectively. The degree of hydronephrosis was graded I, II or III. Considering the frequency and severity of hydronephrosis, the right kidney was affected more. Hydronephrosis correlated significantly with indication, duration and route of surgery as well as patient's age. All kidneys improved spontaneously, except one case which needed ureteral stenting with no surgical intervention ($p=0.05$).

Conclusion: Transient hydronephrosis could occur after simple total hysterectomy despite the absence of any obvious intraoperative ureteral injury. It is noted in 9.5% of the patients within three days after the non-complicated surgery. The clinical course may be continued until one month.

Keywords: Hydronephrosis; Hysterectomy; Surgery

Introduction

Hysterectomy is the most common gynecological surgery (1, 2), also it is one of the reasons for

iatrogenic ureteral injury (3-5). So it can be one of the serious complications of hysterectomy (6). With all hysterectomy methods; the incidence of ureteral injury is not notable, despite the proximity of ureters to uterine, gonadal vessels and uterosacral ligament (7-16). Many injuries do not directly damage the ureter but lead to micro-trauma (8). Ureteral injury occurred

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in 0.78% of surgeries, nevertheless, 62.4% of them were not recognized during the surgery (9). The rate of urological injuries is the same in all types of hysterectomy (8). The range mechanism of injury is variable from pinpoint thermal injury to complete transection (3). Ureteral damage in patients suffering from flank pain just after hysterectomy is probable (1). Also, iatrogenic ureteral injury should be suspected when post-operative renal ultrasonography detects hydronephrosis (5). Many studies have reported hydronephrosis after radical hysterectomy without intraoperative injury (17-25), therefore hydronephrosis can be a side effect in the treatment of cervical cancer (26). Three studies have described this complication after non-radical hysterectomy (27-29). One of them did not identify transient asymptomatic hydronephrosis after simple hysterectomy for benign diseases (27). On the contrary, one study reported hydronephrosis four days after hysterectomy (28), and another study reported mild asymptomatic hydronephrosis as a frequent finding after uncomplicated hysterectomy due to benign diseases (29).

For such contradictions about transient hydronephrosis occurring after non-radical hysterectomies, we conducted this study to evaluate the incidence of transient hydronephrosis after simple total hysterectomy with no recognizable injury to the ureter which was confirmed by sonography. Surgeon's awareness about possibility of physiologic transient asymptomatic hydronephrosis despite the absence of any intraoperative ureteral injury, can reduce his/her anxiety. On the other hand, duration of hospitalization and cost of treatment is decreased. The aim of the study was to determine the frequency, severity and clinical course of hydronephrosis after total hysterectomy.

Materials and methods

In a prospective study, we evaluated 368 women who had undergone total hysterectomy (abdominal or vaginal) with or without bilateral salpingo-oophorectomy at Alzahra Hospital, Rasht, Guilan, Iran, between January 2013 and January 2016. An approval from the Ethics Committee of Guilan University of Medical Sciences and an informed consent from all participants was obtained before enrolling the patients in the study. Inclusion criteria were: all patients who were candidates for hysterectomy (abdominal or vaginal) and were referred to the Gynecological Clinic of Alzahra Hospital (AUB – myoma – endometriosis – uterine malignancy chronic pelvic pain – uterine prolapse –

secondary dysmenorrhea – urinary incontinence). Non-inclusion criteria were all patients who had hydronephrosis before hysterectomy. One day before the surgery, urinary tract ultrasonography was performed repeated at 3, 7 and 28 days after the surgery by the same sonographer (F.M). Repeat sonography has been done on days 7 and 28 after hysterectomy but in cases who had reported hydronephrosis, at 3 days after the surgery. The surgery was carried out by the same gynecologist (M.M.G). In patients with persistent hydronephrosis, the follow-up was extended to one month or more by the same urologist (S.A.A). A Foley catheter with a 5cc balloon was inserted immediately before the surgery and left in place for the first 24 hours after the surgery. Moreover, the catheter was extracted when the residual urine was less than 100mL. In case of doubt about urologic complications, patients were referred to an urologist (S.A.A). Patients with confirmed hydronephrosis before the hysterectomy or intraoperative ureteral injury or those who had lost the follow-up were excluded from the study.

Hydronephrosis is defined as the distention of the renal calyces and pelvic with urine as a result of obstruction of the urine outflow distal to the renal pelvis (30). The degree of hydronephrosis was classified as grade I or mild if ultrasonography confirmed 5-15 mm of dilatation. Grade II or moderate was considered with a central reno-pelvic or pelvic dilatation of more than 15 mm and the presence of distortion of the collecting system with ballooning. Finally, a dilated, tortuous ureter was regarded as grade III or severe hydronephrosis. In this study, transient hydronephrosis was defined as hydronephrosis which disappeared within one month after the operation.

Statistical analysis: In accordance with the frequency of abdominal hysterectomy which has been mentioned at a rate of 35% in Hildebrandt article (29), and considering the total abdominal hysterectomy in table 3 with 95% confidence interval, approximately 368 samples were obtained.

$$n = (z1 - a/2 p(1 - p))/d^2 \sim 368$$

$$P = 35\% , \quad d = 2.4\% , \quad z1 - \frac{a}{2} = 1.96$$

Data analysis was performed using the Statistical Package for Social Science (SPSS Inc., Chicago, IL, USA) version 20. All data were assessed using chi-squared test. A value of 0.05 or less was

considered significant.

Results

From 415 participants who underwent renal ultrasound, 47 patients were excluded due to the following reasons: (I) preoperative hydronephrosis detected by ultrasonography (n=9) (II) withdraw of operation due to medical or anesthetic problems (n=17), and (III) loss of one-week follow-up (n=21). A total of 368 patients entered the study. The mean ± SD age of patients was 48.7±8.9 (40-60) years and the mean ± SD body mass index (BMI) was 28.6 (min=16.6, max=37.2) Kg/m². Altogether, 99 patients (26.9%) had previous surgery (cesarean section and/or tubal ligation). The mean ±SD time of hysterectomy was 93±51 minutes.

No patient had an identified intraoperative ureteral injury. Also none of the patients showing hydronephrosis after 3 and 7 days from the surgery had missed days 7 and 28 of the scheduled follow-up. All patients who were diagnosed at 3 and 7 days following the surgery did not miss until 7 and 28 days after that.

The rest of cases were ready for analysis. Three days after the operation, 35 (9.5%) individuals developed hydronephrosis in each side, while 14 (40%) and 34 (97.1%) showed spontaneous regression of hydronephrosis at weeks 1 and 4 after the operation, respectively. One week later, 5.7% (21 cases) of patients and one month later, 1 patient (0.27%) had hydronephrosis. A total of 368, 368, 35, 35 patients underwent ultrasonography examination a day before and 3, 7 and 28 days after the operation,

respectively.

Right-sided hydronephrosis was noted in 29, 15, 1 patient, while left-sided ones were noted in 20, 6, 0 patients 3, 7 and 28 days after the operation, respectively (Figure 1).

Hydronephrosis disappeared in all patients, except one who showed spontaneous regression on the right side four weeks after the surgery. Another patient developed a grade 3 right-sided hydronephrosis 4 weeks after the surgery and subsequently needed a two-week ureteral stent insertion to resolve hydronephrosis. From a total of 35 cases of hydronephrosis, 29 (8.3%) were mild and 6 (17%) were moderate.

There was a significant relationship between post hysterectomy hydronephrosis and age (Table 1). Hydronephrosis was significantly correlated with indication of hysterectomy (Table 2).

Table 1: Incidence of hydronephrosis by age

Age range (year)	Number of hysterectomy (%) (n= 386)	Number of hydronephrosis (%) (n=35)	p-value
30-39.9	38(10.4%)	8(21%)	0.041
40-49.9	197(53.4%)	10(5%)	0.235
50-59.9	100(27.2%)	13(13%)	0.306
60<	33(9%)	4(12%)	0.318

The difference between the ages of 30-39.9 years and HN was statistically significant (p=0.048)

Hydronephrosis was not seen in cases that underwent TVH. 80% of vaginal hysterectomy was done due to uterine prolapse.

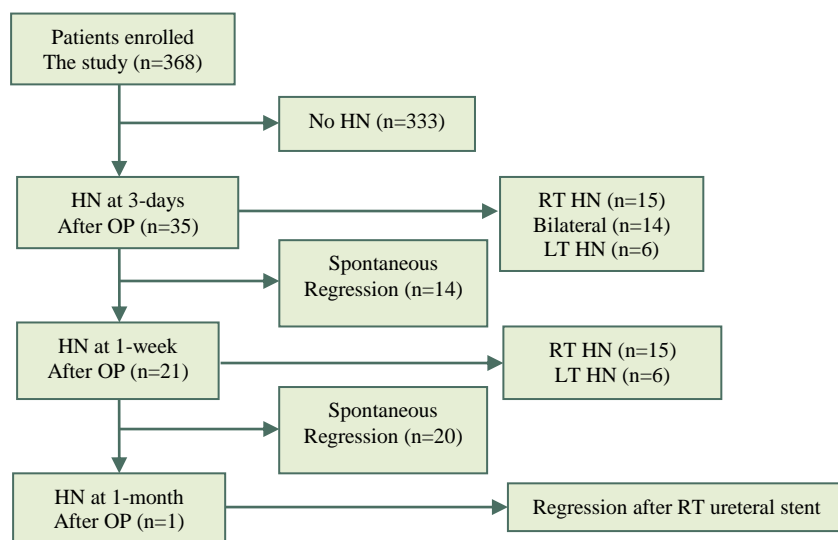


Figure 1: STROBE diagram of natural history of HN after simple total hysterectomy

Table 2: Incidence of hydronephrosis in order of indication

Indication of HYS	Number of HYS (%) (n=368)	Number of HN (%) (n=35)	p-value
Abnormal uterine bleeding	206(55.9%)	14(6.7%)	0.773
Myoma	22(5.9%)	-	0.389
Endometriosis	21(5.7%)	3(14.2%)	0.051
Uterine malignancy	19(5%)	6(31.6%)	0.0001
Chronic pelvic pain	48(13%)	10(20.8%)	0.0001
Uterine prolapse	27(7.3%)	-	0.172
Secondary dysmenorrhea	14(4%)	2(21.4%)	0.149
Urinary incontinence	11(3%)	-	0.235

HN= Hydronephrosis, HYS=Hysterectomy

Using chi square statistical test, there were a significant relation between hydronephrosis and indication of hysterectomy by uterine malignancy and chronic pelvic pain (0.05).

Bilateral hydronephrosis was noted on days 2, 3, 7 and 14 after the surgery. Only one case showed right side hydronephrosis. Three days after the surgeries, 29 patients had mild and 6 had moderate hydronephrosis. While one week after the surgeries, 18 patients had mild, 2 patients had moderate and 1 patient had severe hydronephrosis that became symptomatic. In this patient intravenous pyelography (IVP) was performed after consultation with an urologist (S.A.A) in order to identify the level of ureteral obstruction. Persistent hydronephrosis disappeared in this case after two-weeks of ureteral stent insertion. The frequency and severity was more in the right kidney. Concomitant bilateral salpingo-oophorectomy had no impact on this result.

None of operations showed hydronephrosis when lasting more than 180 minutes (Table 3). Hydronephrosis was mild in all patients undergoing hysterectomy due to benign reasons and was moderate in malignant ones.

Table 3: The association of the route of hysterectomy and the duration of surgery by incidence of hydronephrosis

Variable		Hydronephrosis n (%)	p-value
Route of hysterectomy	Abdominal	35(9.5%)	0.004
	Vaginal	0	
Duration of hysterectomy	<60 min	2 (5.7%)	0.049
	60-119min	10 (28.6%)	0.861
	120-180min	23 (65.7%)	0.592

Using chi-square statistical test, there were a significant relation between hydronephrosis and duration of surgery between 120-180 min ($p=0.005$). Using fisher exact test, there was a significant statistical difference between hydronephrosis and route of hysterectomy ($p=0.044$).

Discussion

We found that 35 (9.5%) cases had transient asymptomatic hydronephrosis throughout 3 days of

simple, uncomplicated total hysterectomy. Not only ureteral injuries are the leading cause of legal problems for gynecologists but also are known as serious complications of surgery.

Renal ultrasonography is the best known non-invasive method to visualize the kidney (31). It is more convenient and cost-effective than intravenous pyelography without any contrast media. However, in the case of persistent hydronephrosis, pyelography was performed by an urologist. Complete or partial transection of ureter was mainly identified and managed intra-operatively (3). Ligation or kinking by suture, crushing from clamp, thermal injury or ischemia from devascularization was present later with more delay which seems to be the result of damaged vascular supply. Denervation, periurethral inflammation and fibrosis can cause ureteral wall edema or disturbed peristalsis (24, 32, 33). Stenosis can be the consequence of obstruction in case of devascularization of the ureteral wall (34). To date, only three studies have reported on the incidence of hydronephrosis in non-radical hysterectomy.

Gautier et al in a retrospective study of ultrasound investigations in 1987 reported that pyelocalyceal dilatation is frequently seen on day 4 after surgery (28). In contrast, in 1997 Woo et al. reported on a series of 50 patients and could not document any case of transient asymptomatic hydronephrosis 3-4 days post operatively (27). In 2013, Hildebrandt reported mild hydronephrosis as a frequent finding after uncomplicated hysterectomy for benign gynecological diseases.

Ureteral obstruction without direct injury may result in local edema at distal ureter, due to surgical manipulation. Surgical techniques improvement decreased the risk of ureteral complications. These techniques include meticulous hemostasis and gentle manipulation of the ureter during dissection from the vesicouterine ligament (17).

Urinary tract complications including transient hydronephrosis are more likely to occur after radical hysterectomy rather than hysterectomy for benign conditions (35). Reported range of post radical-hysterectomy hydronephrosis was 12-68% (17, 18, 21, 23, 24, 26). Hildebrant et al presented that an overall 56.7% of patients showed mild hydronephrosis after uncomplicated hysterectomy. The highest incidence was seen in VH (64.4%) and the lowest after LASH (46.6%) while incidences for TLH, LAVH and AH ranged between 55.2 - 59.5% (29). According to our data, mild hydronephrosis is a frequent finding after non-radical hysterectomy just like Hildebrant et al. Two mechanisms could explain the dilation of renal pelvis with or without hydroureter after radical hysterectomy. One is surgical denervation of ureters resulting in the reduction of the peristaltic movement and the other is obstruction of the ureter due to a surgical lesion or scar tissue formation (22). The outer layer of the ureter contains all of the unique blood supply which comes from the contribution of the renal artery, ovarian artery, common iliac artery, and aorta. It is important to maintain the blood supply of the outer layer of ureter during its dissection (11, 12). On the other hand, a minor crush or needle injuries can be managed conservatively provided that the integrity and viability of the ureter, peristaltic and adequate perfusion are present with no urine leak (34). Reasons for upper urinary tract changes include local edema of the distal ureter caused by surgical trauma, separation of the ureter from walleys sheath, deprivation of the nerve or blood supply, and lymphocyte formation (24). Same mechanisms can involve the urinary system in benign condition surgeries. Possibly, transient paralysis in ureters following any degree of trauma leads to hydronephrosis (1). Despite no obvious ureteral injury, asymptomatic transient hydronephrosis may occur even after a simple total hysterectomy. But more studies are needed to confirm our results. Our research limitation was the lack of an appropriate scale for investigating ureter trauma during surgery. There was no selection bias in this study due to the sampling method used and there was no information bias because we did not request data from patients. The external validity of the study was confirmed by six specialists before the study.

Conclusion

This study shows that asymptomatic transient

hydronephrosis may occur after a simple total hysterectomy, despite no obvious ureteral injury during the operation.

Conflict of Interests

Authors have no conflict of interests.

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